Appendix D ENGINEERING SUBPLAN

1. Purpose.

This appendix provides the general policies and procedures for the execution of quality management activities conducted for engineering products:

Main Body of Appendix D	Quality Management of Engineering Products
Enclosure 1	QM Guidelines for Dam Safety Program
Enclosure 2	Implementation Milestones for Implementing Civil Works Projects
Enclosure 3	QM Guidelines for HTRW & CDQM
Enclosure 4	Definitions used in HTRW & CDQM Projects
Enclosure 5	Acronyms used in HTRW & CDQM Projects
Enclosure 6	Quality Management of Water Control and Water Quality Products

2. Applicability.

2.1. This appendix supplements the guidelines provided in the main body of the South Pacific Division Quality Management Plan and applies to all activities of the CESPD Engineering Division, the Directorate of Engineering and Technical Services, the Directorate of Programs Management and CESPD Districts, which are involved in the preparation, review, and approval of engineering products.

2.2. The quality management process outlined herein applies to all engineering services and products.

3. References.

3.1. ER 5-1-11, Program and Project Management

3.2. ER 1110-1-12, Engineering and Design Quality Management

3.3. ER 1110-2-1150, Engineering and Design for Civil Works

3.4. ER 1110-345-100, Design Policy for Military Construction

3.5. EC 1165-2-203 Technical Policy Compliance Review.

3.6. CEMP-ET Memorandum dated 23 April 1997, SUBJECT: Department of Defense, Inspector General's Audit on the Use of Energy Conservation Measures in the Design of New Military Facilities.

3.7. ER 1110-1-8100, Laboratory Investigations and Testing.

3.8. CESPD R 1110-1-8, Design and Construction Evaluations.

4. Definitions.

See paragraph 4 of main Quality Management Plan.

5. General.

5.1. The policy of the CESPD-ET-E is to deliver quality engineering products, on time and within budget to our customers. The districts are responsible for the preparation of engineering products and the quality control necessary to produce those products. CESPD-ET-E is responsible for quality assurance of the engineering process. The quality management guidance herein is a fully integrated part of the Regional Project Management Business Process.

5.2. Quality Management Plans. The districts are responsible to prepare, and keep current, a Quality Management Plan for engineering and design products. The engineering quality management plan shall be a part of the overall District quality Management Plan and shall provide the general guidance for work produced by the Engineering Division of a district, including the input provided by other functional organizations which support the development of the engineering products. CESPD-ET-E shall evaluate and approve the engineering portions of the district Quality Management Plans.

5.3. Quality Control Plans. All engineering and design services shall be prepared using a product specific, generic or programmatic quality control plan. The district is responsible for preparing the Quality Control Plan. Quality Control Plans shall be embedded within the Project Management Plan (PMP) for a project. If there is sufficient need, a Technical Review Strategy Session (TRSS) may be held shortly after the initiation of design to discuss, revise and finalize the draft QCP embedded within the PMP. The responsible function chief in the district (i.e. Chief, Engineering Division) shall review and approve the quality control plan.

5.4. Quality Assurance. CESPD-ET-E is responsible for quality assurance of quality control activities for engineering products prepared by the districts, to include products designed wholly in house or by a combination of contract and in house forces. For that portion of work conducted by contract forces, the district shall be responsible for quality assurance of the contractor's quality control activities and CESPD shall maintain a general oversight of this process.

5.5. Programmatic/Generic Quality Control Plans: Product specific quality control plans shall be prepared for all products except those of a routine, recurring nature. Cost, complexity, risk and visibility shall be the criteria used to determine if a product specific or programmatic/generic QCP is required. Programmatic or generic QCPs may used for the general categories of engineering products (not covered by product specific QCPs) listed in Appendix A, Table 1,

when their implementation cost does not exceed certain thresholds as listed in the referenced table.

5.6. Funding: Quality control activities performed by Districts shall be funded by the appropriate project. All Division quality assurance activities as well as any quality control activities related to delegated policy compliance review are funded by division funds.

6. District Quality Control Responsibilities

6.1. District shall prepare Quality Control Plans for each engineering product.

6.2. The Quality Control Plan shall be a document supplementing the general quality control activities outlined in the district's Quality Management Plan and describing unique quality control activities for a specific product. As such the length and level of detail should be commensurate with the risk and complexity of the product. The Quality Control Plan shall address (at a minimum) the following:

6.2.1. Name of Project

6.2.2. Description of Product

6.2.3. Name and location of customer

6.2.4. A statement of the quality control plan objective.

6.2.5. A statement of the quality guidelines that will be followed for the technical review.

6.2.6. Members of the product development team.

6.2.7. Members of the Independent Technical Review Team with a statement of the technical qualifications of each member in their respective areas of expertise. (Including Mandatory Centers of Expertise.)

6.2.8. Major Milestones

6.2.9. Unique, sensitive or high visibility items requiring special attention. Include items, which require technical or policy clarification, and environmental constraints such as complying with records of decision.

6.2.10. A list of documents to be reviewed by the independent technical review team, and dates of scheduled reviews.

6.2.11. Special interest items such as value engineering, cost controls, contractor evaluation procedures, acquisition strategy, etc.

6.2.12. Partnering or conflict resolution procedures for the stakeholders.

6.2.13. Discussion of constraints on the process, such as staying within budget, on time, and how these constraints may affect the quality of the finished product.

6.2.14. A list of financial resources that shall be allocated to the quality control process, including review, and a breakdown by discipline and by product. The cost estimates for conducting the independent technical review shall be included as a separate line item in the study/product development cost estimate.

6.2.15. The quality control plans for all engineering documents that are supported by NEPA or other environmental documentation shall include an independent technical review to ensure consistency between the environmental documentation and the engineering documents.

6.3. Approval of Quality Control Plans. The responsibility for review and approval of QCPs is delegated by CESPD to its districts. The Chief of Engineering Division at the district preparing the quality control plan for engineering products shall certify (i.e. review and approve) that the plan meets the customer's needs and conforms to Corps of Engineers requirements by reviewing and approving the QCP.

6.4. Use of Checklists: Checklists may be used to guide the independent technical review and insure that critical items are not overlooked. Checklists may also be used to simplify the documentation of the independent technical review. The use of checklists in the documentation would not, however, eliminate the requirement to document specific comments.

6.5. Monitoring/Fostering Technical Competency: Assuring that the team members who perform the work have the knowledge, skills and experience is an essential element of quality control and quality assurance. Quality assurance includes an evaluation of the district's development and maintenance of the technical competency for production and review.

6.6. Quality control of contractors work: The district shall prepare a quality control plan which discusses the contractor's quality control and it's relationship to the entire project. For design-build contracts, the A-E shall develop and follow a QCP for their product including independent technical review of the design product and construction quality assurance activities. District review of submittals shall be to assure compliance with the request for proposal (RFP) and for QA of the contractor’s quality control activities. The contractor's quality control plan shall be approved by the responsible function chief at the district. The district's quality control plan for the overall engineering product, including quality control of in house activities and it's quality assurance of contractor activities, shall be reviewed and approved by the Chief, Engineering Division.

6.7. QC Certification and Final Documentation: Proper documentation is a key component of an effective independent technical review process, and is a significant resource for lessons learned in the quality control process. Significant decisions must be recorded and the entire process must leave a clear audit trail. Whether a project is submitted to higher headquarters or approved within the district, the Chief of Engineering Division shall recommend to the District Commander (DE) that the DE certify that the quality control process for that product has been completed and that all identified technical issues have been resolved. The DE’s certification

may not be down delegated. This certification and accompanying documentation shall be in accordance with Appendix H and shall be made a part of the official District project files. For products approved at headquarters, copies of the QC certification and documentation shall accompany the product to headquarters. For products either approved at headquarters or within the district, copies of the QC certification and associated documentation shall be provided to CESPD-ET-E for informational purposes. Certification requirements for a range of engineering products are shown in Table A-3 of Appendix A.

6.8. General Requirements. The following requirements apply to all engineering products except as noted:

6.8.1. Independent Technical Review Process: In addition to supervisory/peer review, quality control procedures shall include independent technical and seamless review.

6.8.1.1. Formation of Independent Technical Review Team (ITRT):

6.8.1.1.1. The ITRT shall be assigned representatives from disciplines involved in product development, such as plan formulation, economics, environmental, hydrology and hydraulics and coastal engineering, water quality, HTRW, civil design, structural design, geotechnical, real estate, project management and other disciplines, as required. Since careful coordination between these disciplines is required, the ITRT must include senior staff with broad expertise. The members of the ITRT must be independent from those who perform the work. Supervisors and work leaders of product development team members shall not be included on the ITRT. Individual ITRT members shall serve in a part time capacity and 50% or less of their work shall be review. If sufficient staff is not available in a district, or if specialized review expertise is required, the review team leader and respective functional chiefs shall supplement the review team with personnel from other districts, other divisions, headquarters, Regional Technical Specialists, centers of expertise, laboratories, the customer's organization or by contract. Project funds shall be used to pay for the cost of conducting technical reviews. A district in need of review assistance shall find the expertise needed and negotiate the schedule and cost for the required services. The formation of the review team should consider regional interests, resources, special expertise requirements and unusual complexity.

6.8.1.1.2. For Water Control Products. Districts shall consult with MSC Water Control Center staff when selecting a water control ITRTeam member. Reference Enclosure D-6 for specifics regarding Quality Management of Water Control related products.

6.8.1.2. Seamless Review: To maintain a seamless review concept, products shall receive a technical review before they are integrated into the overall product. A memorandum of record shall be the basis for establishing accountability for the quality of the product and the review. Each member of the ITRT shall prepare a memorandum documenting their comments, including a statement that a reviewer has no comment on a product if such is the case, which shall become part of the ITRT's records. Specific issues raised in the review shall be documented in a comment, response, action required and action taken format. Unresolved differences between the study/product development and ITRT members shall be documented. The Automated Review Management System (ARMS) shall be encouraged for use in all

projects and is required for all MILCON products. These reviews must be completed prior to major decision points in the process so that the technical results can be relied upon in setting the course for further activities.

6.8.1.3. Product Review: The QCP shall identify products to be reviewed by the ITRT, a schedule as well as cost for these reviews. These products shall be essentially complete before review is undertaken and the branch and section chiefs shall be responsible for accuracy of the computations through design checks and other internal procedures, prior to conduct of an independent technical review. The products shall be reviewed using an interdisciplinary team approach. The products shall be reviewed for scope, adequate level of detail, compliance with guidelines and policy and customer needs, consistency, accuracy, and comprehensiveness as outlined in the QCP.

6.8.1.4. Integration of Prior Reviews: ITRT members shall review their counterpart's portions of the product. The review shall determine whether prior seamless review activities have produced the technical product envisioned during the seamless review. Material reviewed in the seamless review phase shall not be subjected to additional detailed review, except when the products is significantly different from the product previously reviewed; or if it is the judgment of the ITRT that the product quality can be improved within established funding and time limitations.

6.8.1.5. Interdisciplinary Review: All members of the ITRT shall be expected to raise concerns in other functional areas. These concerns shall be addressed to the ITRT as a whole. The ITRT shall then work through the appropriate ITRT counterparts to resolve the issues/concerns. ITRT meetings shall be open to representatives of CESPD for quality assurance purposes and to the customer. It shall be the responsibility of the ITRT leader to seek resolution of disagreements among ITRT members before referring issues to the product development team members.

6.8.1.6. Responses to ITRT Comments: The ITRT shall meet with the study/product development team to resolve the raised issues. Along with a description of the scope of the review, all review comments shall be documented in a comment, response, action required, action taken and backcheck format. In those cases where unresolved disputes between the design team and the ITRT are decided by a functional chief, the review documentation shall provide the basis for the functional chief's decision.

6.8.1.7. Dispute Resolution: The ITRT leader shall review the documentation to identify any outstanding disagreements between members of the design team and the ITRT. Any disagreements shall be brought to the attention of the appropriate functional chief to facilitate resolution of technical disagreements between design team and ITRT counterparts.

6.8.2. Issue Resolution Conferences: Three types of issue resolution conferences may be held. The first would be at the request of a district to provide technical and policy assistance on major issues, usually on a particular project/product. The second would be held at the request of CESPD, to address major issues raised as a result of quality assurance activities. And, the

third would be those mandatory issue resolution conferences required for specific engineering products as required by engineering regulations.

6.9. Civil Works Products.

6.9.1. Civil Works Milestones. As part of the Quality Control process, Districts shall follow a milestone system for development of civil works engineering products in the design (post feasibility) phase. Although a formal milestone system is a difficult mandate, guidance is provided below for minimum requirements. Specific milestone objectives shall be tailored to the engineering product and included in the product's Quality Control Plan. A detailed description of each milestone is provided in Enclosure 2 of this subplan.

Milestones for Civil Works projects are significant or important events in the execution of the project. Milestones are important tools for measuring progress along a pre-defined path to the completion of the project. The milestones that are defined below are not a complete list of all activities that must be performed to complete a project. These milestones are considered to be the major accomplishments that must be completed on schedule to help ensure that the overall final product is technically correct and satisfactory to the local sponsor. The numbers shown in parentheses indicate milestones tracked by Programs and Project Management Division and included in the Project Executive Summary Report. Milestones tracked by headquarters as Command Management and Review (CMR) dates are identified by "(CMR)".

6.9.1.1. Design Documentation Report Milestones:

D1 Design Documentation Report Initiated (400)
D2 General Design Conference (270)
D3 Technical Review Strategy Session
D4 Quality Control Plan Approval
D5 Value Engineering Study Completed
D6 Submit Intermediate Design Documentation Report for Independent Technical Review
D7 Submit Near-Final Design Documentation Report for Independent Technical Review
D8 Local Sponsor Review Completed
D9 Quality Control Certification
D10 Design Documentation Report Approval (480)

6.9.1.2. Plans and Specifications Milestones:

P1 Plans and Specifications (P&S) Initiated (500)
P2 Design Coordination Meeting
P3 Technical Review Strategy Session
P4 Quality Control Plan Approval
P5 Submit Intermediate P&S for Independent Technical Review
P6 Submit Near-Final P&S for Independent Technical Review
P7 Biddability, Constructability, Operability and Environmental (BCOE) Review Conference
P8 Final Local Sponsor Review Meeting
P9 BCOE Certification

P10 Quality Control Certification
P11 Plans and Specifications Approval (290)(590) (CMR)

6.9.1.3. Engineering During Construction Milestones:

C1 Pre-Advertise Contract in Commerce Business Daily
C2 Construction Contract Advertised (950)
C3 Government Estimate
C4 Bid Opening (951)
C5 Engineering Considerations and Instructions to Field Personnel Report
C6 Construction Contract Awarded (960) (CMR)
C7 Final O&M Manual Transferred to Local Sponsor (981)
C8 As-Built Drawings Transferred to Local Sponsor (982)

6.9.2. Hydraulic, Hydrologic and Related Products.

6.9.2.1. Activities associated with the development of hydraulic, hydrologic, water quality, water control, sediment, groundwater and related products shall be outlined in the format of a Hydrologic Engineering Management Plan (HEMP), as required by EP 1110-2-9. The HEMP is a quality control measure for ensuring the complete outline of required H&H related activities and their interrelationship with other product development activities that are required in the development of engineering products, and their costs, and is consistent with guidelines set forth in ER 1110-2-1150. The HEMP format shall be utilized in the H&H related scoping contained in a study's/project's PSP or PMP, respectively.

6.9.2.2. Certification of the Without-Project Hydrology - Civil Works GI Studies. Because of the critical need to establish the without-project hydrology early in a flood control planning study, the Chief of the district element that is responsible for the hydrologic analysis will certify the hydrology prior to the first milestone conference in the feasibility phase. This certification will be included in the review documentation.

6.9.3. Engineering Appendices for Decision Documents.

6.9.3.1. Submittal of Engineering Appendices. An engineering appendix is an essential part of a feasibility report or post-authorization decision document for a Civil Works project. Similar to other portions of the decision document, the technical review of the engineering appendix is a district responsibility. For decision documents that are approved by the district, the policy compliance review will also be a district responsibility. And, for any decision document that is not approved at the district, the policy compliance review of the engineering appendix has been delegated to CESPD. Either a printed copy or an electronic copy of the engineering appendix will be transmitted to CESPD with the draft decision document for policy compliance review. A printed copy of the engineering appendix will be included with the submission of the final report since the appendix will be published with the final decision document that supports authorization or the signing of a PCA.

6.9.3.2. Section 1202 of WRDA 1986. Section 1202 of WRDA 1986 (PL 99-622) requires that any report submitted to Congress for the purpose of authorizing or funding the "construction of a water impoundment facility, shall include information on the consequences of failure and geologic or design factors which could contribute to the possible failure of such facility." This requirement can be met by including the analysis in the Engineering Appendix and a summary of the consequences in the recommendation section of the main body of the report. The independent technical review of the decision document should identify and confirm that the requirements of Section 1202 have been met.

6.10. Military Construction, HTRW, WFO and SFO programs. The following special requirements apply to these programs.

6.10.1. Design review shall be in accordance with ER 1110-345-100 paragraph 9 and ER 1110-1-12 paragraph 6h(3) except that design by private A-E firms shall normally be reviewed by the A-E with a quality assurance review by the district. Requirements include but are not limited to the following:

6.10.1.1. A QCP should be prepared for every engineering product or service whether obtained using in-house forces, an A-E or an A-E product in a design-build contract. While the QCP should be complete, it need not duplicate items in the QMP.

6.10.1.2. For contract work, the A-E shall be required to submit a QCP with the fee proposal. The nature of the QCP shall be determined with the A-E in pre-proposal meetings. The QCP should be provided to the project manager for incorporation into the project management plan (PMP) prior to initiation of the technical work on the project. For large or complex projects the A-E may be allowed to submit a generic QCP with his fee proposal, with a fully detailed QCP furnished in the first phase of the work. The extent of the independent review should be commensurate with the complexity of the project and is not intended to be a detailed check. All design reviews will be accomplished using the Automated Review Management System (ARMS). Designs prepared by private A-E firms will normally be reviewed by the A-E, with a quality assurance review by the district office. Only a single level of review shall be required for concept design.

6.10.1.3. A QCP shall be submitted for A-E products in a design build contract, which conforms to the requirements in the QMP. Designs prepared by A-E firms in design build contracts shall normally be reviewed by the A-E with a a quality assurance review by the district office. In design build contracts, the district shall review design submittals to assure compliance with the RFP.

6.10.1.4. Review of in-house designs and quality assurance reviews of A-E products should be performed by a interdisciplinary team specifically selected based on project requirements. The use of Regional Technical Specialists and Technical Centers of Expertise and Centers of Standardization for projects is strongly encouraged. Certain projects or portions of projects require special design procedures or review by the Mandatory Centers of Expertise (MCX). These MCX include the Utility Monitoring and Control System MCX; HTRW MCX; Intrusion

Detection Systems MCX; Protective Design MCX; Army Range and Training Land Program MCX; and Transportation Systems MCX.

6.10.2. The relationship with programs and project management will be as defined by reference 3.1 above.

6.10.3. Engineering products for the Military, WFO, and SFO programs shall be reviewed in accordance with a QCP. The QCP shall be developed using the district QMP and division QMP as guides. However due to the wide variety of products and the unique requirements imposed by various customers, the individual QCP may be adjusted to meet any special requirements.

6.10.4. Quality management guidelines for HTRW and CDQM programs are provided in Enclosure D-3.

6.10.5. Quality control plans shall address the energy conservation measures and energy budget as required by reference h in paragraph 3 of this appendix.

6.11. Flood Recovery Efforts: See also Construction-Operations Subplan, Enclosure 3, Operations and Readiness Function. Due to its special requirements, Natural Disaster Procedures are classified as a unique function of the Corps as prescribed in the Division organizational guidelines. Quality control of products resulting from flood recovery efforts is prescribed in the existing engineering regulations outlined in the above referenced subplan as well as below:

6.11.1. Code 200 Emergency Operations (Flood Response and Post Flood Response): Due to the emergency nature of the products developed under this authority, quality control of flood response products shall consist of peer or supervisory review, only, prior to implementation. Quality control of post-flood response products shall be accomplished by CESPD until an approved QCP is developed and approved by the district.

6.11.2. Code 300 Rehabilitation Assistance: Quality control plans and independent technical review are required for products developed under this authority.

6.12. QA/QC of Laboratory Investigations and Testing: The responsibilities, policies, procedures for laboratory investigations, materials and chemistry testing and analytical services performed in support of design, construction and operation of Civil Works, Military and Support for Others programs are outlined in reference 3.8 above.

7. Division Quality Assurance Responsibilities

7.1. Quality Assurance of the Engineering and Design Process. CESPD shall perform quality assurance of the engineering and design process. This shall include evaluation of command management review indicators and other measurements that are to be developed.

7.2. Execution: As part of the CESPD team, quality assurance responsibilities shall be executed by representatives of CESPD-ET-E consistent with paragraph 7 of the main body of the South Pacific Division QMP:

7.2.1. **Focus Area #1: Develop and Maintain the CESPD Quality Management Plan:** CESPD-ET-E shall develop the Engineering Subplan and have input into the overall Division Quality Management Plan.

7.2.2. **Focus Area #2: Review and Approve District Quality Management Plans:** CESPD-ET-E shall participate in the review and approval of each District's Quality Management Plan.

7.2.3. **Focus Area #3: Monitor Development and Execution of Product Quality Control Plans:** CESPD-ET-E shall ensure that procedures are in place within each district for the development, review, approval and execution of product specific, generic and programmatic quality control plans for engineering products. The responsibility for review and approval of QCPs is delegated by CESPD to its districts. CESPD-ET-E shall ensure compliance with approved QCPs by periodically verifying the independence of independent technical reviews (ITR), resolution of comments, documentation, etc. CESPD-ET-E shall oversee the district QA role when the district conducts QA activities for A-E and other contracted products. This also includes oversight of district QA plans for monitoring construction contractor's QCPs.

7.2.4. **Focus Area #4: Audit District Quality Processes.** CESPD-ET-E shall review district products for QC Process Evaluation. This includes meeting periodically with districts to review their quality control processes through evaluation of selected products and services at various stages of development to assure compliance with the QMP. Feedback to the district on these quality assessment audits is essential for district process improvement as feedback to HQUSACE for lessons learned distribution throughout USACE. The QA audit of civil works products may utilize as one performance measure the Management Control Evaluation checklist in Appendix H of ER 1110-2-1150.

7.2.5. **Focus Area #5: Review and Evaluate Performance Indicators.** CESPD-ET-E shall proactively track existing performance indicators and develop and maintain regional indicators as required. This includes the quarterly district Quality Management Indicator report previously described above. Identify areas needing command attention to assure a viable organization that is responsive to USACE customers through quality products.

7.2.6. **Focus Area #6: Continuous Involvement in Product Development.** CESPD-ET-E shall participate in selected project meetings as required by policy guidance and as needed for high visibility and/or complex projects. MSCs are to assist in resolution of policy and/or technical issues and interface with HQUSACE as appropriate, approve deviations from criteria and conduct selected project site visits.

7.2.7. **Focus Area #7: Partner, Coordinate and Mentor with District.** CESPD-ET-E shall provide for continuous dialog and interactions with counterparts to keep them informed of upcoming work, training, new regulations, etc. Also, develop and implement regional guidance, provide regional training, share lessons learned and facilitate changes in criteria, facilitate

partnering and sharing of resources across districts and evaluate district technical capabilities and needs. Quality assurance also includes an evaluation of the district's development and maintenance of the technical competency for production and review of a product.

7.2.8. **Focus Area #8: Approve/Certify Programming Activities.** CESPD-ET-E shall provide support to the CESPD Directorate of Program Management in its coordination of programming activities with HQUSACE and districts.

7.2.9. **Focus Area #9: Conduct and Provide Feedback on Command and Staff Inspections.** CESPD-ET-E shall examine mission execution, level of training, FTE resources, workload, compliance with standards and regulations and obtain feedback on morale, welfare, discipline and problems/needs through command assistance visits.

7.3. District Support Teams: District Support Teams were chartered to support the districts in the execution of their programs. They are tasked to provide maximum support to the districts in delivering projects to its customers. In the context of quality management, this would include providing oversight and quality assurance of the district's overall quality management program, assisting the districts on project specific issues, performing policy reviews for delegated actions, processing district products through CESPD, HQUSACE and ASA (CW), performing quality assurance audits as well as the full range of quality assurance activities as outlined above. The District Support Teams shall include representation from Engineering in addition to members from Planning, Construction-Operations, Real Estate and Counsel.

7.4. Design Construction Evaluations (DCE). As part of CESPD's quality assurance responsibilities, CESPD-ET-E and CESPD-ET-C have jointly established and are executing a DCE program within CESPD. This program is detailed in CESPD R 1110-1-8 and fully conforms to the requirements in ER 1110-1-12. The DCE program generally shall utilize the processes outlined in the QA Focus Areas, above.

7.5. Delegated Responsibilities of CESPD: Approval authority for a number of programs has been delegated to CESPD-ET-E. In addition to quality assurance responsibilities for technical review, CESPD has quality control responsibilities for policy compliance of delegated authorities. In that regard, CESPD-ET-E is responsible for policy compliance review of products that are approved by the Division Commander. HQUSACE will provide policy QA of programs/documents delegated to CESPD-ET-E. Procedures for CESPD-ET-E policy compliance review of all decision documents for delegated programs are addressed within the appropriate subplan. See Appendix A, Table 2 for list of delegated responsibilities.

ENCLOSURE 1
QUALITY MANAGEMENT GUIDELINES FOR DAM SAFETY PROGRAM

1. Purpose

This enclosure provides specific information on the application of QA/QC to the South Pacific Division dam safety program and all documents related to that program. Although Engineering Division has primary responsibility for this program, Planning and Construction-Operations Divisions also play a significant role.

2. Reference

2.1. ER 1110-1-8, Required Visits to Construction Sites by Design Personnel and CESPD Supplement 1.

2.2. ER 1110-1-1801, Construction Foundation Reports.

2.3. ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures.

2.4. ER 1110-2-110, Instrumentation for Safety Evaluation of Civil Works Projects.

2.5. ER 1110-2-1150, Engineering and Design for Civil Works Projects.

2.6. ER 1110-2-1155, Dam Safety Assurance Program.

2.7. ER 11 10-2-1156, Dam Safety - Organization, Responsibilities and Activities.

2.8. ER 1110-2-1802, Reporting Earthquake Effects and CESPD Supplement 1.

2.9. ER 1110-2-1901, Embankment Criteria and Performance Report.

2.10. CESPD R 1110-1-2, Engineering Considerations and Instructions to Field Personnel

2.11. CESPD R 1110-1-7, Interagency Cooperation between the U.S. Army Corps of Engineers and State Dam Safety Regulatory Agencies.

2.12. CECW-A Memorandum No. 2, Implementation of New Technical and Policy Review Procedures, 14 April 1995.

2.13. CECW-EP Memorandum, Engineering, Design and Dam Safety Guidance, 31 May 1995.

2.14. ER 1110-2-101, Reporting Evidence of Distress in Civil Works Structures.

2.15. EP 1110-2-13, Dam Safety Preparedness.

2.16. CECW-EG, Guidelines for the Use of Technical Experts for the Geologic, Seismologic, Geotechnical and Materials Aspects for Civil Works Projects, 15 August 1997.

3. Dam Safety Quality Management Plan

Each district shall prepare a Quality Management Plan for Dam Safety which will be part of the overall district QMP submitted annually to CESPD for review and approval. The QMP for Dam Safety shall describe district procedures for assuring the quality of products unique to the dam safety program, such as Periodic Inspection reports, Dam Safety Assurance Program reports, Construction Foundation reports, Embankment Criteria and Performance reports, and Instrumentation reports. The QMP shall specify the members of the District Dam Safety Committee.

4. Dam Safety Committee

The MSC Dam Safety Committee (DSC) is responsible for the coordination and implementation of the dam safety program within the MSC, as set forth in reference 2g. The Director of Engineering and Technical Services is the MSC Dam Safety Officer and chairman of the DSC. The DSC will conduct a minimum of two meetings per year, or as needed. In addition, it is the policy within South Pacific Division for the MSC Dam Safety Committee to meet annually with the district Dam Safety Committees. The QA responsibilities of the MSC Dam Safety Committee include:

4.1. Ensure that organizational staffing of qualified personnel is sufficient and that the safety program is established and realistically funded.

4.2. Establish dam safety related work priorities within the MSC.

4.3. Conduct QA activities for all features of major civil works projects.

4.4. Monitor activities related to performance monitoring and evaluations of all dams.

4.5. Monitor status of Emergency Action Plans.

4.6. Monitor the public awareness program and coordinate with state agencies as required.

4.7. Ensure that adequate dam safety training is being conducted.

4.8. Ensure that accurate data are submitted for the inventory of Corps dams.

4.9. Plan, monitor, and conduct dam safety exercises.

5. Dam Safety During the Planning Process

The MSC shall randomly conduct QA reviews of planning documents for projects that include, or might include, dams. These documents include reconnaissance reports and feasibility

reports. The siting of dams is of particular concern during this process, in relationship to earthquake faults and foundation conditions. See Appendix C, Planning Subplan, for details of this review process.

6. Dam Safety During the Engineering and Design Process

The MSC shall randomly conduct QA reviews of engineering and design documents related to dam projects. These documents are described in reference 2e, and include DDRs, plans, specification, cost estimates and Engineering Considerations and Instructions to Field Personnel (reference 2j). See Appendix D, Engineering Subplan, for details of this review process.

7. Dam Safety During Construction Process

The MSC shall conduct QA reviews of the construction process on all dam projects. This will require occasional visits to the construction site by the MSC Dam Safety Committee to assure that the dam under construction is being adequately inspected and tested, that the construction is in accordance with the plans and specifications, and that good construction records are being kept. Reference 2a provides guidelines on appropriate times to visit the construction site. See Appendix F, Construction Subplan, for details. Project specific triads shall be held as explained in reference 2k.

8. Dam Safety After The Construction Process

The safety of a dam after construction depends on periodic inspections and evaluations as described in reference 2c. The scheduling of these inspections, the inspections themselves, and the inspection reports are all the responsibility of the Districts. The MSC, to satisfy its QA mission, shall occasionally participate in the inspections. In accordance with reference 2c, paragraph 5c, as modified by reference 2m, districts will perform technical review of the inspection reports and the MSC will approve the reports. An ITRT review will not be required for periodic inspection reports, but the reports should receive a thorough internal review prior to being forwarded to the MSC for approval.

9. Dam Foundation Reports and Embankment Reports

These reports are prepared by field personnel during construction and shortly after completion of the dam. They are extremely important documents for evaluating the performance of the dam, particularly in addressing any future questions that might arise regarding the safety of the structure. References 2b and 2i indicate that the MSC has approval authority for these documents, however subsequent HQUSACE guidance is that technical review will only be conducted at the district level. These documents, therefore, will be treated in a manner similar to planning and design documents, so a Quality Control Plan (QCP) will be developed for each document. An independent technical review team (ITRT) will be established by the District to review the work.

10. Instrumentation Reports

Reference 2d requires that instrumentation data, along with appropriate written evaluations, be consolidated yearly and sent to the MSC for review. These data and evaluations should receive a thorough independent technical review prior to being sent to the MSC.

11. Dam Safety Assurance Program (DSAP) Reports

Dam Safety Assurance Program (DSAP) reports are reviewed and approved by HQUSACE in accordance with reference 2f. ITR of these documents shall be performed by the district. The MSC will also review selected documents, and attend In Progress Reviews and Technical Review Conferences as part of its QA mission. The MSC should receive information copies of all relevant documents.

12. Reporting Earthquake Effects

The districts' Operations Branch is responsible for the immediate assessment of earthquake damage and notifying the Chief of Engineering Division as required in reference 2h. The Engineering Division will formulate an inspection program, conduct post-earthquake inspections, process and analyze instrumentation data, evaluate the condition of structures, and prepare inspection reports. The district's dam safety QMP will set forth procedures to assure that high quality post-earthquake assessments, inspections, evaluations and reports are obtained.

13. Reporting Evidence of Distress

Evidence of distress at a dam project will be immediately reported to the District Office and up through channels in accordance with reference 2n. If follow-up engineering evaluation reports are necessary or if remedial construction is required, reports and plans should be reviewed by an ITRT.

14. Cooperation with Dam Safety Agencies

The Corps of Engineers and South Pacific Division have a policy of cooperating fully with state dam safety agencies (reference 2k). These state agencies have a QA mission similar to the MSC, with the purpose of assuring that dams constructed within their state are safe. They review dam designs and inspect dams under construction. A dam may not be put into operation until it is certified as safe by the state dam safety agency. In California, the MSC meets regularly with the California Division of Safety of Dams, districts and local sponsors to discuss the safety aspects of dams being planned, designed and constructed by the Corps in that state. The MSC is involved to a lesser degree with state dam safety agencies in Utah, Nevada, Arizona, Colorado and New Mexico.

ENCLOSURE 2
IMPLEMENTATION MILESTONES FOR CIVIL WORKS PROJECTS

1. Purpose

The purpose of this enclosure is to establish a system of major milestones that must be utilized for Civil Works projects in the Pre-Construction Engineering and Design (PED) phase and the Construction General (CG) phase so that product delivery teams, supervisors and their staffs are aware of the milestones and their importance.

2. Establishing and Monitoring Milestone Schedules

Major milestones shall be established for all Civil Works projects in the PED and CG phases and included in the Project Management Plan. Specific milestone objectives shall be tailored to the product and included in the product's Quality Control Plan. The Product Development Team, led by the Project Manager, is responsible for establishing milestone dates and for obtaining concurrence with the dates of Engineering Division branch chiefs and of other functional chiefs involved in product development. Budget constraints and sponsor's desires provided by the Project Manager shall be reflected in the milestone schedule.

3. Definitions of the Implementation Milestones

A brief discussion of each of the milestones and their completion dates are included in the paragraphs below. The limited descriptions provided do not relieve designers and reviewers of the responsibility for complying with all fundamental guidance found in other HQUSACE, CESPD and District ERs in carrying out the activities addressed in these descriptions.

3.1. D1 Design Documentation Report Initiated (400). The results of required design studies and technical analyses not completed during the feasibility stage are presented in a design documentation report (DDR). The date that PPMD authorizes and funds any element of Engineering Division to begin work on the DDR is the date of the completion of this milestone.

3.2. D2 General Design Conference Session. The purpose of the General Design Conference (GDC) is to discuss the current project plan, project background, objectives, schedules, costs, design options, major issues, problem areas, and the type of documents which must be prepared and the level of detail in those documents. The GDC shall be held early in the design stage and may integrated into the Technical Review Strategy Session outlined below. Major topics of discussion will include a description of the authorized plan with appropriate graphics, issues and problem areas, any recommended alternative analyses identified at the time, a list of documents to be prepared, and descriptions of the technical studies and analyses to be accomplished. A site visit should be included as part of the design conference. CESPD and HQUSACE may elect to participate in this activity. The D2 milestone will be achieved on the date that the GDC is successfully completed.

3.3. D3 Technical Review Strategy Session. A Technical Review Strategy Session (TRSS) will be held in accordance with the main body of this QMP. The TRSS may be held concurrently with or shortly after the GDC. The draft QCP for the DDR, embedded within the PMP, shall be discussed and finalized. For multiple feature projects, an additional TRSS shall be held to address each required DDR and associated plans and specifications. This milestone is achieved upon completion of the memorandum documenting the meeting.

3.4. D4 Quality Control Plan - Review and Approval. A Quality Control Plan (QCP) is required for each project as part of the technical review and quality management program of the District. For multiple feature projects, more than one QCP may be prepared addressing the various elements of the project. The milestone will be achieved on the date that the QCP is approved by the Chief, Engineering Division.

3.5. D5 Value Engineering Study Completed. The Corps' current policy requires that value engineering (VE) studies be performed on all USACE projects or project elements with a programmed cost of $2,000,000 or more unless a determination can be made that a study would not be cost effective. A VE study shall be performed on the earliest document available that satisfies the functional requirements of the project or project element and includes a comprehensive (M-CACES) cost estimate. The milestone is achieved on the date that the VE study is approved by the Chief of Engineering Division.

3.6. D6 Submit Draft DDR for Intermediate Independent Technical Review. A draft DDR shall be submitted to the ITRT Leader for review by the ITRT. Each technical element of the Product Development Team shall also provide a synopsis of remaining work. This milestone will be completed when the ITRT Leader receives the draft documentation. This milestone may be omitted if the omission is addressed in the QCP or with written approval by the Chief, Engineering Division.

3.7. D7 Submit Near-Final DDR for Independent Technical Review. Independent technical review of the DDR shall be conducted in accordance with guidance in the main body of this QMP. The DDR shall be essentially complete before the Near-Final Document Review is undertaken. The document shall be reviewed for scope, adequate level of detail, compliance with guidelines and policy, consistency, accuracy, and comprehensiveness. This milestone is met when the ITRT Leader receives the draft documentation.

3.8. D8 Local Sponsor Review Completed. At the same time that the Independent Technical Review Team begins their review of the "near-final" materials, a copy of those materials shall be sent by the design team's Project Manager to the local sponsor for formal review and comment. The local sponsor is expected to provide formal written comments on the DDR. Each one of the local sponsor's comments will be answered. The date of the letter signed by the Chief of Engineering Division that transmits the responses to the local sponsor's comments is the date of achievement of this milestone.

3.9. D9 Quality Control Certification . When the Near-Final review has been completed, review comments have been documented, and all comments and issues have been resolved, the documentation of the independent technical review and other quality control processes

prescribed in the QCP shall be made a part of the official project files. The Chief of Engineering Division shall recommend to the District Commander (DE) that the DE certify that the quality control process for the DDR has been completed and that all identified technical issues have been resolved. This certification shall be in accordance with the guidance provided in the main body and Appendix D of this QMP. The date of the certification memorandum signed by the District Commander is the milestone completion date.

3.10. D10 Design Documentation Report Approval (480). After the Design Documentation Report has been finalized, a DDR approval memorandum shall be signed by the Chief of Engineering Division. The date that this memorandum is signed is the date that this milestone has been achieved.

3.11. P1 Plans and Specifications (P&S) Initiated (500). P&S shall be prepared in accordance with established HQUSACE and CESPD guidance. They should contain all the necessary information required to bid and construct the plan detailed in the Feasibility Report engineering appendix or in the Design Documentation Report. The date that PPMD authorizes and funds any element of Engineering Division to begin work on the P&S is the date of the completion of this milestone.

3.12. P2 Design Coordination Meeting. A design coordination meeting will be conducted at the initiation of plans and specifications preparation. The local sponsor shall be invited to send representatives to this meeting. The design team and Architect-Engineer (A-E) staff, if applicable, will also attend. The milestone will be achieved upon successful completion of the meeting.

3.13. P3 Technical Review Strategy Session Meeting. A Technical Review Strategy Session (TRSS) will be held in accordance with the guidance provided in the main body of this QMP. The QCP embedded within the PMP shall be reviewed and revised as required This milestone is achieved upon completion of the memorandum documenting the meeting.

3.14. P4 Quality Control Plan - Review and Approval . A Quality Control Plan (QCP) is required for each set of P&S as part of the technical review and quality management program of the District. If the QCP for the DDR addressed the plans and specifications, a separate QCP will not be required and the milestone will have been met. If the DDR QCP did not address the plans and specifications, a separate QCP shall be required. If the DDR QCP addressed the plans and specifications, but conditions have changed so that the DDR QCP no longer accurately reflects the QCP for the plans and specifications, a supplement to the DDR QCP shall be prepared to reflect current conditions. The milestone will be achieved on the date that the letter is signed by the Chief, Engineering Division

3.15. P5 Submit Draft Plans and Specifications (P&S) for Intermediate Independent Technical Review. Draft P&S containing the material established in the TRSS milestone (P3) memorandum shall be submitted to the ITRT Leader for review by the ITRT. Each technical element of the Product Development Team shall also provide a brief synopsis of remaining work. This milestone will be completed when the ITRT Leader receives the draft

documentation. The Intermediate Review may be omitted if the omission is addressed in the QCP or with written approval by the Chief, Engineering Division.

3.16. P6 Submit Near-Final P&S for Independent Technical Review . The P&S will be essentially complete before the Near-Final Document review is undertaken. The products shall be reviewed for scope, adequate level of detail, compliance with guidelines and policy, consistency, accuracy, and comprehensiveness. This milestone will be completed when the ITRT Leader receives the draft documentation.

3.17. P7 Biddability, Constructibility, Operability (BCO) and Environmental Review Conference. Upon completion of the independent technical review of the Near-Final P&S by the ITRT and the BCOE review by Construction-Operations Division and Planning Division, a BCOE conference shall be held to discuss and resolve the comments in accordance with ER 415-1-11. This milestone is completed when the meeting has been held.

3.18. P8 Final Local Sponsor Review Meeting. Local sponsor involvement is encouraged during the preparation of P&S. After formal local sponsor review comments have been received and addressed, a meeting will be held with the local sponsor to discuss the review comments to ensure that there is a complete understanding of the comments and that the appropriate corrections and modifications have been or will be made. If ongoing coordination during the design has resulted in agreement on local sponsor comments, this meeting may not be necessary and may be canceled at the request of the local sponsor. This milestone is achieved upon successful completion of this meeting.

3.19. P9 BCOE Review Certification (580). Upon completion of the BCOE backcheck, a certification will be signed by the Chief of Engineering Division and the Chief of Construction-Operations Division and sent to the Chief of Contracting Division. The date of certification by the Chief, Construction-Operations Division is the date of achievement of this milestone.

3.20. P10 Quality Control Certification. When the Near-Final Document Review has been completed, final review comments have been documented, and all comments and issues have been resolved, the documentation of the independent technical review and other quality control processes prescribed in the QCP shall be made a part of the official project files. The Chief of Engineering Division shall recommend to the District Commander (DE) that the DE certify that the quality control process for the P&S has been completed and that all identified technical issues have been resolved. This certification shall be in accordance with the main body and Appendix D of this QMP. The date of the certification memorandum signed by the District Commander is the milestone completion date.

3.21. P11 Plans and Specifications Approval (590) (CMR). After the P&S have been finalized and the District Commander has signed the certification of quality control, the cover sheet of the plans will be signed by the Chief of Engineering Division certifying approval of the entire set of plans and specifications. The date that the plans are signed is the date that this milestone has been achieved.

3.22. C1 Pre-Advertise Contract in Commerce Business Daily. An announcement that an Invitation for Bids (IFB) for a construction contract is about to be issued must be advertised in the Commerce Business Daily newspaper 15 calendar days prior to issuing the IFB. The FAR requires that an additional 10 calendar days be allowed for the mail ing and processing of the announcement for a minimum total of 25 calendar days to complete the announcement. Typically an additional 5 days is programmed by the District for a total of 30 days for the process. This milestone is met on the day that the announcement is mailed to the CBD.

3.23. C2 Construction Contract Advertised (950). This milestone is met on the day that the initial complete set of plans and specifications is first made available to prospective bidders.

3.24. C3 Government Estimate. The Government estimate is based on final plans and specifications and is the formal, approved construction cost estimate prepared to support contract award. A Government estimate is required for all contracts, or modifications exceeding $25,000 (FAR 36.203 and ref 1.g.). When the Government Estimate has been approved by the Chief of Engineering Division (ref 1.g., Appendix C), this milestone has been achieved.

3.25. C4 Bid Opening (951). IFB's for construction contracts must be advertised for no less than 30 days. Sealed bids are opened by the Contracting Division. Bid opening is held no sooner than 10 days after all significant amendments to the Plans and Specifications have been issued. The day that the bids are opened is the day that this milestone is achieved.

3.26. C5 Engineering Considerations and Instructions to Field Personnel Report. In preparation for the beginning of each major construction contract, the Project Engineer will prepare a report outlining the engineering considerations and providing instructions for field personnel to aid them in the supervision and inspection of the contract. The requirement for and a discussion of the contents of the report is contained in section 11.o. of ER 1110-2-250. A suggested outline of such a report for a dam is presented in ER 1110-2-1150. The report will normally be provided to the Resident Engineer well in advance of award. The milestone is completed on the date that the transmittal letter is signed by the Chief of Engineering Division.

3.27. C6 Construction Contract Awarded (960)(CMR). Contracts are awarded by the Contracting Division after analysis and recommendations from the Construction-Operations Division and Programs and Project Management Division. Engineering Division is sometimes consulted on contract awards, especially if there is a large difference between the low bid price and the Government Estimate. This milestone is very important to Engineering Division because it is a CMR indicator for Engineering Division. The date of this milestone is the date of the letter awarding the contract.

3.28. C7 Final O&M Manual Transferred to Local Sponsor (981). The O&M Manual and the Water Control Manual, if applicable, are the responsibility of the Engineering Division. The manuals will be completed and fully coordinated with the local sponsor during the construction phase of the project. In addition, if required by the site conditions, a HTRW documentation report will be prepared during construction and will serve as a permanent record of all HTRW-related activities at the project. A copy of this report will also be provided to the local sponsor.

This milestone is met when the final version of the required manuals and HTRW documentation report have been sent to the sponsor.

3.29. C8 As-Built Drawings Transferred to Local Sponsor (982). As-built drawings will be prepared and maintained by Construction-Operations Division. Using a set of marked-up drawings prepared by the Resident Engineer and the contractor, the Project Engineer will ensure the completion of as-built drawings. Copy of as-built drawings shall be forwarded to Engineering Division. This milestone is met when the as-built drawings have been sent to the sponsor.

ENCLOSURE 3
QUALITY MANAGEMENT GUIDELINES
FOR
HAZARDOUS TOXIC RADIOACTIVE WASTE (HTRW) PROGRAMS
AND
CHEMICAL DATA QUALITY MANAGEMENT (CDQM)

1. Overview

1.1. Purpose: Provide guidance on quality management of CESPD and its Districts' HTRW (sometimes also known as environmental engineering) programs and CDQM.

1.1.1. CEMP-RT Memorandum, Subject: Technical roles and Responsibilities for the USACE Hazardous, Toxic, and Radioactive Waste (HTRW) Program, dated 24 July 1996 mandates that the HTRW quality assurance (QA) role of the major Subordinate Command (MSC) is to assure that the established QA processes are implemented. This Memorandum itemizes the roles and responsibilities of the functionaries in the HTRW program. Quality Umbrella Assurance Diagnostics (QUADs) protocol presented during the 2nd Annual HTRW QA Workshop in March 1997 provided additional guidance on the MSCs' QA roles and responsibilities, and which was reinforced during the 3rd Annual HTRW QA Workshop in March 1998.

1.1.2. Engineering Regulation 1110-1-263, Appendix C-1, states that the primary purpose of Chemical Data Quality Management (CDQM) for HTRW remedial activities is to ensure that all chemistry data are of known quality and can withstand scientific and legal challenge relative to the use for which the data are obtained.

1.2. Applicability: This guidance applies to HTRW programs within CESPD and its districts, and to all elements within CESPD and its districts having responsibilities for execution of HTRW programs. These elements include those within the Directorate of Engineering and Technical Services and the Directorate of Program Management. HTRW programs include CERCLA, RCRA, WFO, SFO, FUDS, and Army ER.

1.3. References:

1.3.1. EPA QA/R-2, Interim Draft Requirements for Quality Management Plans.

1.3.2. ER 5-1-10, Corps-wide Areas of Work Responsibility.

1.3.3. ER 5-1-11, Program and Project Management.

1.3.4. ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous, Toxic and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities.

1.3.5. ER 715-1-20, Architect-Engineer Contracting.

1.3.6. ER 1110-1-12, Engineering and Design Quality Management.

1.3.7. ER 1110-1-263, Engineering and Design, Chemical data Quality Management for HTRW Remedial Activities.

1.3.8. ER 1180-1-6, Construction Quality Management.

1.3.9. EM 200-1-1, Environmental Quality, Validation of Analytical Chemistry Laboratories.

1.3.10. EM 200-1-2, Guidance for HTRW Data Quality Design.

1.3.11. EM 200-1-3, Requirements for the Preparation of Sampling and Analysis Plans.

1.3.12. EM 200-1-6, Environmental Quality, Engineering and Design, Chemical Data Quality Assurance, Guidance for Hazardous, Toxic, and Radioactive Waste (HTRW) Sites.

1.3.13. EM 385-1-1, Safety and Health Requirements Manual.

1.3.14. EC 15-1-16, Information Resources Management (IRM) Committees.

1.3.15. CEMP-RT, Memorandum, dated 24 July 1996, subject: Technical Roles and Responsibilities for USACE Hazardous, Toxic, and Radioactive Waste (HTRW) Program.

1.3.16. ER 1110-1-8100, Engineering & Design Laboratory Investigation and Testing.

1.3.17. EM 200-1-4, Environmental Quality, Risk Assessment Handbook Human Health Evaluation, Volume 1: Human Health Evaluation. CEMRO-HX-S Memorandum, subject: HTRW-CX Technical Review Process.

1.3.18. ER 1110-1-8100, Laboratory Investigations and Testing

1.4. CESPD's HTRW and CDQM QA Oversight Activities: CESPD shall utilize a modified version of CEMP-RT's HTRW Quality Umbrella Assurance Diagnostics (QUADs) program to execute its HTRW and CDQM QA oversight activities. The hierarchical components of QUADs are:

- Quality Assurance Manager (QAM) - CEMP-RT
- Quality Control Verification (QCV) - Chief, CEMP-RT
- Technical Liaison Manager (TLM) - HTRW-CX
- Technical Branch Chiefs - HTRW-CX
- Quality Control Verification (QCV) - Director, HTRW-CX - Chief, HTRW-HX-S
- Quality Assurance Coordinator (QAC) - CESPD-PM
- HTRW-Design Districts
- Non-HTRW-Design Districts.

QA responsibilities and logistics of the QUADs members are specified in the Table below.

TABLE 1
RESPONSIBILITIES OF QUAD MEMBERS

QUADs Components	Function	Funding Source
Quality Assurance Manager (QAM) - CEMP-RT	- Participate in each QA oversight visit - Monitor the QA Process nation-wide - Provide periodic updates on QUADs activities to USACE senior management - Interphase with HQ USEAP on regulatory QA requirements.	CEMP
Quality Control Verification (QCV) - Chief, CEMP-RT	- Verification of the QUADs process via oversight visit(s) at the selected MSC.	CEMP
Technical Liaison Manager (TLM) - HTRW-CX	- HTRW-CX serves as the coordinating agency for the QA oversight visits. - TLM assigned to support the Design Districts(s) serves as the project officer for each Division QUADs oversight visit. - TLM is responsible for coordination of the QUADs process with the MSC QA Officer. - TLM will select the projects to be observed and lead the oversight visit & prepare a report of the QA oversight findings. - Ideally the TLM will select projects (Category B) from those which have already undergone technical review by the HTRW-CX staff.	HTRW-CX
Technical Branch Chiefs - HTRW-CX	- Technical branch chiefs assigned to HTRW-CX will develop a formal checklist of items in the technical arenas considered critical to the success of an project which will be used to record evaluation from reviewed projects selected by the TLM for use in the oversight process (Example see Attachment II).	HTRW-CX
Quality Control Verification (QCV) - Director, HTRW-CX Chief, HTRW-HX-S	- Verification of the QUADs process at the selected oversight visits.	HTRW-CX

TABLE 1
RESPONSIBILITIES OF QUAD MEMBERS

QUADs Components	Function	Funding Source
Quality Assurance Coordinator (QAC) - CESPD-PM	- Establish, *collect and review annually* HTRW Quality Management Plans to insure product quality & maintain QA of subordinate HTRW design districts. - Keep senior CESPD management informed about QA issues within the division. - Provide an overview of CESPD's QA program and significant findings from past year at the annual QA Workshop. - Coordinate oversight activities with subordinate HTRW Design and non-HTRW Districts. - Coordinate with CX, Districts during QAM, QCV QA oversight visit at Division. - Monitors any corrective actions required.	CESPD
HTRW-Design Districts	- Perform QA on HTRW projects assigned to geographically supported non-HTRW Design District(s). - Response to requests from the CESPD QA Officer. - *Prepare and update annually the District HTRW Quality management Plan.* *-Prepare for and present CDQM data on selected CEMP at tri-annual CDQM audit.* *-Prepare for and present Innovative Technology data to CEMP at bi-annual Innovative Technology audit*.	CEMP / CESPD Design District
Non-HTRW-Design Districts	- Response to requests from HTRW Design District.	District

1.5. Overall Strategy for HTRW QA: CESPD's QUADs oversight visits at districts will focus on the Data Quality Objective process and Technical Project Planning for HTRW Data Quality Design.

1.6. Division QA Activities on Chemical Data Quality Management:

1.6.1. CESPD personnel or TLM-CX may participate in Counterpart Consultation/In-Process Conferences with the HTRW Design District to facilitate resolution of technical issues with HTRW-CX and HTRW policy issues with HQUSACE.

1.6.2. Conduct technical evaluation of technology transfer and innovation based on the criteria of:

- Regulatory requirement – Essential
- Added value - Important
- Nice to have

1.6.3. Participation of an individual from CESPD on a product's technical review team would compromise that individual's ability to perform QA on that product. Such double duty is prohibited. No individual is permitted to perform QA functions on a product that he/she was involved in producing.

1.6.4. Identify, inventory and monitoring the submission of Category B project documents required for HTRW-CX review per reference 1.3.15. Category B projects include the National Priority List (NPL), Base Realignment and Closure (BRAC) projects in the RI/FS phase, and those projects using innovative technology and/or the construction cost is greater than $5m in the RD/RAC phase.

1.7. QA/QC of Laboratory Investigations and Testing: The responsibilities, policies, procedures for laboratory investigations, materials and chemistry testing and analytical services performed in support of design, construction and operation of Civil Works, Military and Support for Others programs are outlined in reference 1.3.18, above.

1.8. Definitions and Acronyms: Acronyms and definitions in HTRW documents are, at times, equivocal and somewhat confusing. Enclosures 4 and 5 contain definitions and acronyms, respectively extracted from EM 200-1-6, Environmental Quality, Engineering and Design, Chemical Data Quality Assurance, Guidance for Hazardous, Toxic, and Radioactive Waste (HTRW) Site, for consultation.

2. Quality System Description

South Pacific Division (SPD) and its districts develop and implement quality management practices, including quality assurance (QA) for related programs and quality control (QC) for various projects, that ensure that technical products meet the agreed upon requirements of the customer and the appropriate laws, policies, and technical criteria, on schedule and within budget. QA involves those planned and systematic actions necessary to provide adequate confidence that product or service activities are performed satisfactorily and safely. Quality Control (QC) is an integral part of the overall QA functions and is comprised of those actions necessary to control and verify that activities and resulting products or services meet or exceed established requirements. USACE performs both QC and QA activities in the delivery of products and services to our customers and partners.

2.1. Quality Management Plans. SPD and its Districts have established Quality Management Plans prescribing their policies and procedures for the execution of quality management activities. The District QMPs are reviewed and approved by the Division on an annual basis.

2.2. Quality Control Plans. A quality control plan (QCP) is prepared by the Districts for every HTRW product or service and by the A-E contract forces for contracted work. These plans are updated as needed. Contract forces may include other Corps offices, other government agencies, and private industry sources. The QCP includes, at a minimum, (i) a statement of the plan objective, (ii) a statement of the guidelines that are followed for the technical review, (iii) a milestone list and schedule for review activities which integrate the mandated division milestones, (iv) a list of documents to be reviewed by the technical review team, (v) a discussion of proposed deviations from the approved quality management plan, (vi) a description of the resources required to accomplish the activities outlined in the QCP. The cost estimate for conducting the independent technical review is included as a separate line item in the project management plan (PMP).

Routine or minor products may utilize generic QCPs consistent with overall QA/QC roles. Programmatic QCPs may be developed and utilized for major programs with routine projects. Generic and programmatic QCPs include the minimum items listed above. The chief of the functional elements having overall responsibility for a product or service is responsible for development of the QCP with input from other functional elements involved in development of the product or service. Exceptions to minimum requirements for QCPs are submitted to the District QA officer for approval.

2.3. Quality Assurance Plans A separate (government) Quality Assurance Plan is developed for contracts administered by the Corps of Engineers, to assure that the contractor's quality control system is functioning as stated. The Quality Assurance Plan includes a Surveillance Plan and outlines testing frequencies for engineering, construction, and analytical products and services.

2.4. Independent Technical Review. A key to the successful execution of the quality control process for products and services is the independent technical review or assessment of a product. This review is accomplished by an independent technical review team (ITRT) composed of individuals having expertise in disciplines involved in the type of product being developed and reviewed, and who were not involved in development or supervision of the development of the product. Typically, ITRT members are identified in the QCP. Five review options are available to Districts for conducting independent technical reviews. The reviews are conducted (i) within the District, (ii) by another District, (iii) in Centers of Expertise (CX), (iv) by teams or individuals throughout USACE, or (v) by a contract team or consultant. For complex projects, technical experts or consultant review is sometimes needed in addition to normal review. Independent technical review does not replace the need for and conduct of design checks or supervisory review of products. Sufficient time and resources are allocated to this process commensurate with the risk and complexity of the technical product. Review comments are to be constructive in nature, relevant to the product and contain the following elements: (1) A clear statement of the concern; (2) The basis of the concern; (3) The significance of the concern; and (4) The specific actions needed to resolve the concern. The ITRT leader shall

review the products and ITRT comments and product development team responses to identify any outstanding disagreements between members of the product development team and the ITRT. Disagreements are brought to the attention of the appropriate functional chief to facilitate resolution. If the interaction does not resolve the issue, the functional chief makes the final decision. Issues resulting from independent technical reviews are to be resolved at the District level, with assistance of SPD, HTRW-CX, OE-CX, and HQUSACE as needed. As policy issues develop, if it is necessary to seek guidance from HQUSACE it is obtained through the functional program manager's coordination. The District is responsible for the technical and policy content of all documents produced within the District. The technical review team documents technical issues and concerns raised during the technical review process and also documents the resolution of these issues and concerns.

2.5. Project Management Plan (PMP). Each project is managed in accordance with a project management plan. This project management plan is developed by the PM with the customer and the other project delivery team members. The PMP is developed and maintained at a level of detail commensurate with the size and complexity of the project. It is a living, working level document that records the history, documents commitments by SPD, the District, and the customer, and depicts the future direction of the project. A properly prepared PMP is a binding agreement among all elements supporting the project that details how the work is executed and how resources are expended. It defines the quality requirements, baseline scope, schedule, and resources, including contingencies, for the project. The schedule and funding levels are to be realistic and reflect overall program and budget constraints and realities. It considers all project requirements including real estate, planning, design, engineering, construction, environmental, operations, and other types of work whether performed by SPD districts, the customer, or by contract (or). The Project Review Board (PRB) approves the plan and all subsequent changes that are beyond the PM's delegated authority.

2.5.1. The controls and quality requirements placed on the management of each project are consistent with the risks (sensitivity, complexity, uncertainty, etc.) associated with that project and tailored to meet customer requirements consistent with national priorities and policies.

2.5.2. All projects are periodically evaluated by the project delivery team against the baseline requirements (quality, scope, schedule and cost) established in the project management plan. The PM has the responsibility to challenge work in progress, identify variances and evaluate alternatives. The project delivery team's focus for meeting project execution goals is to maintain the baseline requirements in the project management plan. Controls are in place to facilitate timely corrective actions to ensure that changes do not exceed performance thresholds or limitations established by laws, policy or regulations. All changes within project resource requirements defined in the management plan are approved by the PM. The PM has the primary responsibility for fiscal integrity and authority to control project funds to ensure they are used appropriately and in accordance with the project management plan. The PM, in coordination with appropriate functional elements, is also responsible for taking prompt action to correct problems identified by internal and external evaluations.

2.6. Review and Assessment SPD reviews and approves each of its Districts' QMP and generic QCP at least annually for compliance with Division (USACE) standards and continuous

improvement updates. The HTRW-CX, when requested, provides technical assistance for issues relating to the Districts' QCPs for products and services. Quality management (assurance) reviews for selected District products and services are conducted annually by multi-disciplined Division Teams.

Project/Program Review Board (PRB) meetings are held periodically at the Division and Districts to keep senior management informed of progress, resolve issues, and assess performance. PRBs comprise the Commander and his or her designated senior staff members. Customers may participate in PRB meetings as deemed appropriate by the Commander. Evaluating project performance produces opportunities to further improve Corps business processes, in terms of execution, productivity, cost effectiveness, streamlined processes, timeliness, quality standards, and customer service. Project experiences, including success stories, are documented by the PM and the project delivery team to share lessons learned throughout the Corps.

SPD will periodically review its own as well as the executing organizations' implementation of the USACE PMBP to evaluate the effectiveness of their quality assurance, efficiency, and execution. Executing organizations (i.e., districts, field operating activities (FOAs), laboratories, etc.) shall periodically assess their project and program management processes and practices to ensure effective implementation of the plan requirements.

2.7. Data Quality Objectives (DQOs). USACE uses Data Quality Objectives (DQOs) to formally document the desired sampling and analysis activities. DQOs are developed using the Technical Planning Process (TPP) as discussed in Section 7.2. The TPP developed DQOs address all of the elements in the EPA 7-Step DQO process and meets the American National Standard E-4 for planning the collection and evaluation of environmental data (ANSI/ASQC 1994).

2.8. Data Quality Assessment. Data Quality Assessment is accomplished by two primary reports, the Chemical Data Quality Assessment Report (CDQAR) and the Chemical Quality Assurance Report (CQAR), or their equivalents as described in ER 1110-1-263 (ref. 1.3.7.). The CQAR is based, mostly, on the QA sample (sent to a laboratory other than the primary laboratory) data, appropriate field and QC data, and Chain of Custody information. The CDQAR is based primarily on field and QC data (including duplicates), laboratory control samples, and various spiked matrix samples. The data are also checked against the DQOs for usability. Additional details are discussed in Sections 8 and 9.

3. Personnel Qualifications and Training

3.1. Personnel Staffing Requirements A prerequisite for the production of a quality product or service is to ensure that personnel working on the project have adequate technical skills to do the work. All personnel selected to work on environmental programs are qualified to perform assigned tasks in accordance with requirements. It is imperative that District staffing levels include sufficient senior professionals to perform current work and provide appropriate on-the-job training of junior staff members. An adequate staff of junior members is to ensure continuation of the District's institutional and technical knowledge.

3.2. Short Term Training. It is the policy of the Corps of Engineers to provide appropriate training and development opportunities to assure maximum efficiency of civilian members in the performance of their official duties. Training needs are reviewed, and effective training practices and techniques applied in efforts to raise individual performance and to meet present and anticipated needs for individual knowledge, skills and abilities. The Corps has developed a wide array of HTRW courses and workshops tailored to the environmental mission needs

3.3. Long Term Training. To keep the Corps abreast of managerial, technical, and scientific advancements, some members may need training opportunities beyond the customary short-term programs. A variety of long-term training opportunities are provided by DOD, HQDA, HQUSACE and local activities.

3.4. Resource Sharing. The development of new technologies, criteria, and methods also requires a minimum technical expertise level for each discipline, depending on the extent and nature of product, service, or project accomplished by in-house personnel. Utilization of these District specialists Division-wide or as instructors in Corps sponsored short courses is often employed to improve SPD capabilities. The Directorate of Engineering and Technical Services Division at SPD identifies HQUSACE mandatory specialist requirements and evaluates them against their respective District staffing; canvasses the respective Districts annually to identify professional experience levels by discipline, specialty area, and technical expertise; and evaluates these experience levels against the quality and review of the products being produced. Any additional training requirements are to be done either by Division or District personnel, as practical.

3.5. Individual Development Plans. It is the objective of SPD to promote the retention/development of technical expertise of District and Division engineering staffs by encouraging developmental assignments, quality training, professional registration, participation in technical societies and conferences, etc

4. Procurement of Items and Services

The policy of the Corps is to deliver excellent engineering and design services and products to customers on schedule and within budget. The procurement process in the Corps is governed by the Federal Acquisitions Regulations (FAR), the Defense Federal Acquisition Regulation Supplement (DFARS), the Army Federal Acquisition Regulation Supplement (AFARS), and the Engineer Federal Acquisition Regulation Supplement (EFARS). The principles of customer focused environment, continuous process improvement, and empowerment of people and other tools in ER 1110-1-12 (ref. 1.3.6.) that are used to improve quality of in-house services also contribute to improving the quality of products and services achieved through contracts. For products developed either wholly or partially by a contractor, development and execution of a QCP for the contractor product is the responsibility of the contractor. An overall quality assurance plan is developed for quality assurance activities by the District for overseeing the contractor's quality control activities. The PM is to discuss with the customer the acquisition process and various options to ensure that customer and project needs are met.

4.1. A-E Contracts. Architect–Engineer contracts are used to perform professional engineering, architectural, and surveying services. They are typically used to perform remedial investigation/feasibility study work and remedial designs. Most environmental work is performed as task orders under indefinite delivery/indefinite quantity (ID/IQ) contracts (described in section 4.2.3.).

4.1.1. Procurement Process. The procedures for contracting for architect and engineer services are in accordance with the Brooks Architect Engineer Act. The guidance and purpose are intended to promote fair, efficient and consistent A-E contracting practices throughout USACE. Commanders regularly evaluate the A-E contracting process in their commands to ensure compliance with all applicable procurement laws and regulations in the most efficient and effective manner. HQUSACE elements identify and implement regulatory and procedural changes to improve the A-E contracting process throughout USACE and effectively implement new laws and procurement regulations. Periodic Quality Management Reviews, staff assistance visits, special reports, informal coordination, conferences and other appropriate methods are used to monitor the compliance of the USACE commands with the contracting regulations.

Proposed contracts for A-E services are negotiated contracts structured to maximize competition, provide contract opportunities for many firms, and maximize small business and small disadvantaged business participation while satisfying the needs of the Government in the most effective, economical, and timely manner. Public announcements for A-E services reflect the minimum needs of the Government, not arbitrarily restricting eligible firms, and describe the specific work required in sufficient detail to facilitate a meaningful selection of the most highly qualified firm.

4.2. Remediation and Construction Contracts. The very nature of remediation not only creates the need for more innovative methods for cleaning up hazardous sites, but also requires innovative types of contracts to accomplish cleanup missions. This section will summarize the various contracts used by the USACE for remediation services and present an overview of their advantages over traditional contracting methods.

It is the policy of the Corps of Engineers to maximize use of sealed bid procedures for execution of its contracts. The policy is in accordance with 10 U.S.C. 2304 (a) and FAR 36.103. Most construction contracts follow the typical sequence of completion of design before initiation of construction. Most of these same contracts are executed by sealed bid procedures and awarded as a firm-fixed price (FFP) contract.

However, remediation activities typically include many unknowns, and do not always involve construction. Many consist of excavation and treatment or excavation and disposal. Most criteria are performance based and involve subsurface conditions, quantities, and concentrations that are difficult to define. For this reason, other forms of contracts are commonly used to achieve environmental restoration. Any contract type other than an Invitation for Bid (IFB) is negotiated. Negotiated contracts can be either cost-reimbursable or firm fixed price. Some contracts are specific to the job, others are indefinite delivery/indefinite quantity

(ID/IQ) with the flexibility to issue task orders specific to the job. These features are described below:

5. Documents and Records

Proper documentation is another key component of an effective quality control process. Significant comments, issues, and decisions are recorded and the entire process leaves a clear audit trail. The documentation of the independent technical review and other quality control processes prescribed in a product's QCP is included with the submission of a specific product to the HTRW CX. For those products that the function chiefs transmit to their respective division, the function chief shall certify that the quality control process for that product has been completed and that all technical issues that have been identified have been resolved. For those products that the District Commanders transmit to the division or to headquarters, both the chief of the functional element responsible for the product and the District Commander shall sign the certification. Copies of the certification and accompanying documentation are included in the District project files. Chemical Quality Assurance Reports and Chemical Data Quality Assessment Reports from all projects are monitored by the HTRW Center of Expertise (CX). The CX reviews 10% of these reports and also receives an electronic version of each report that facilitates archival maintenance of these documents.

5.1. Record Keeping Procedures. In order to identify and retrieve environmental records, SF135s boxes and labels are clearly marked to reflect the name of the environmental program such as Superfund, and contain a statement that reads "DO NOT DESTROY" based on the continued moratorium on destruction of environmental restoration records in effect since 1991. The documentation describes the records in sufficient detail to permit quick retrieval when needed.

5.2. Functional Proponents For Superfund Records. The functional proponents responsible for safeguarding records in support of remedial design and remedial action for the Defense Environmental Restoration Program (DERP) are given below. USACE uses these guidelines to ensure consistent maintenance of all applicable documents for EPA projects. Details will depend upon the specific Program and project needs. The standard may be relaxed or tightened in consultation with the customer and in keeping with reasonable project requirements.

5.2.1. Roles And Responsibilities. The following functional proponents have been identified as the "Office of Record" for Superfund records as implemented throughout USACE. The functional proponents are responsible for creating, filing, identifying, and maintaining the records required supporting the documentation and costing recovery effort required by the Superfund Amendments and Reauthorization Act (SARA).

This is not an all-inclusive list and other documents critical to support cost recovery may be included. Anything maintained in these files is subject to full disclosure in a court of law. Any memo or telephone record that represents a personal opinion of an event, person, or thing is removed from the file before they are sent to a records holding area. Records, such as contracts and invoices, do not need to be permanently stored in the technical files. The District

Contract Office has responsibility of maintaining the contract files for a particular site and the District Resource Management Office has responsibility for maintaining invoices and receiving reports.

To the greatest extent possible progress reports and correspondence are filed in chronological order. When these files are no longer needed to support a particular phase the files can be transferred to a records holding area and retrieved if needed.

Working Files - Records used in the process of design or construction as working files need to be identified as working files. At the end of an identified period, these files can be purged of duplicative material. The identified functional proponents have the responsibility to safeguard permanent files for record retention (as outlined below).

5.2.1.1. Functional Proponent Outline.

A. Project Management Division (Files):
A record of all the Project Managers assigned to a particular project during its life is created and maintained. This record will consist of:

- Project Manager and the period of time he or she worked on the project
- Forwarding Addresses of project managers if departed from the organization
- Project Management Plan
- Project Budget and Schedules
- Monthly Progress Reports
- Internal and external correspondence relating to the site.

B. Engineering Division (may be combined with other Divisions):
Pre-Design / Design documents
Plans and Specs
AS Builts
Environmental Assessment
QA reports for chemical testing
Meeting minutes with the RD contractor
Contractor evaluation reports
Trip reports
Cost estimates
Site Specific Safety and Health Plan
Meeting minutes and correspondence with state and local regulators

C. Value Engineering (may be located in Engineering or Construction Division):
Results and recommendations of VE studies.

D. Construction (if/when items are applicable) (may be combined with other Divisions):
Bid ability, **C**onstructibility, **O**perability, and **E**nvironmental Review
Progress Reports
Inspection reports

Monitoring and sampling data
Field logs
Internal and external correspondence
Minutes of any coordination or public participation meetings
Quality Assurance Plan
QA reports for chemical testing
Site Specific Safety and Health Plan
Notes from meetings with the contractor
Originals and come back copies of manifests
Performance Evaluations
Deliverables required by statements of work with contractors
Newspaper articles, videos, pictures of the site
QA reports during the execution phase
Meeting minutes and correspondence with state and local regulators
OSHA Monitoring and Sampling Data

E. Contracting Division:
Government cost estimates
Abstracts of bids
Accepted and unsuccessful bids
Notices to proceed
Signed executed contract
Change orders and modifications
Start and stop orders
Contract property accounts
Wage rate and labor problems
All other documents determined by the contracting officer as essential for completion of the individual contract.
Contract correspondence
Documents relating to the close out of the contract

F. Real Estate Division:
Rights of Entry
Title Search
Land Grants/Deeds
Land Lease/Property Purchase

G. Safety and Occupational Health Office:
Accident and Investigation Reports for Contractors and Government Employees
OSHA Violations

H. Resource Management Office:
The financial records consist of all documents substantiating cost to a project. This is the most critical piece in the documentation process. For a document to be admissible, three conditions are met:

I. The documents must show the relationship between the cost being incurred and the project Charged;

II. The documents must be properly authorized by an individual delegated with that Authority;

III. There must be proof of disbursement.

The migration to Corps of Engineers Financial Management System (CEFMS) does not diminish the Corps responsibility to maintain cost documents generated by Corps of Engineers Management Information System (COEMIS). The following is a list of the different types of cost records for which the Resource Management Office continues to be responsible:

COEMIS Records:
Interagency Agreements
Certified labor documents
Working papers used to establish Overhead, Indirect and Burden rates
Effective rate computations
Travel documents to include travel order, reimbursement voucher, traveler receipts, ENG 4480
Contract pay estimates (ENG 93), certified by the COR and associated ENG 4480s
Other contractual obligations to include purchase orders, imprest fund vouchers, credit card purchases and associated invoices, receiving reports, and ENG 4480s.
Motor Vehicle Charges (vehicle logs and distribution vouchers)
Reproduction costs (DPA print requests and distribution vouchers)
Laboratory costs (work order and distribution vouchers)
Cost transfers requests and ENG 4479/ENG 4480 support documents
Disbursement vouchers to include signatures and check numbers

CEFMS Records:
Interagency Agreements
Working papers used to establish Overhead, Indirect and Burden rates if the rates are not computed using the CEFMS Budget Module
Effective rate computations
Travel vouchers and supporting documentation including receipts
Contractor Invoices
Cost transfer requests

5.3. Technical Guidance Documents. USACE publications are used Corpswide to promulgate directive, administrative, technical, instructional, and other types of information. These publications include Supplements to Department of Army Regulations, Engineering Regulations

(ERs), Engineering Circulars (ECs), Engineering Pamphlets (EP), Engineering Manuals (EM); Office Memorandums (OM), Engineer Technical Letters (ETL), and Miscellaneous Publications such as Charts, Design Guides, ENG Maps, Plans, Posters and a limited number of unnumbered publications (UN).

HQUSACE develops guidance and implementing instructions with technical assistance from the Centers of Expertise and makes this information available to the Divisions and Districts. Most of the publications are coordinated with the Divisions, Districts, and Centers of Expertise prior to finalization and issuance. The use of these standard publications helps to ensure all Corps entities are performing work in a standardized and uniform manner.

6. Computer Hardware and Software

6.1. Organizational Policy. It is the policy of USACE to promote the widest acceptance and broadest perspective in the development of Corps information resources and to assure that data collected, analyzed, processed, and maintained on all automated data processing systems, in support of USACE programs and functions be accurate and of sufficient integrity to support effective quality management as established by USACE Information Resources Management (IRM) Program. USACE activities have a local Information Resources Management Steering Committee (IRMSC) or equivalent.

There is no in-house software development in the environmental programs at this time. All of the programs used are either commercial off the shelf (COTS) software or programs that are made available by the Environmental Protection Agency, the Air Force, the Army, or other agency. COTS software is generally purchased at the request of the customer or because it is widely used by the Corps of Engineers.

Information Management Offices within each Division and District are responsible for validating and approving the requirements for the purchase and maintenance of all hardware and software. They also ensure that applicable Information Resource Management (IRM) requirements and standards are met.

Corporate automation information systems (AIS) for project and financial management are used to manage each project and program. Developing, defending, and maintaining budgetary data and all other information necessary to manage a project is the responsibility of the PM. Supervision of this process, along with development and maintenance of all program data and oversight of the AIS, is the responsibility of the District's Deputy for Programs and Project Management (DPM). The DPM will also supervise the aggregating of program and project data so as to facilitate review and management recommendations by the District/Division senior staff, and informed decision-making by the Commander.

6.1.1. Automated Review Management System. The Automated Review Management System (ARMS) is used to manage design review comments. The use of this system is encouraged on Corps projects but is not mandatory. ARMS provides an effective and economical means of compiling and assembling comments from all reviewing elements, coordinating comments by deleting inappropriate or duplicate comments, and back checking to ensure proper resolution.

At this time, ARMS is the only approved system for automated management of review comments for Corps projects. Dr. Checks is a similar program for managing review comments that is being developed by CERL that is accessed through the Internet. CESWD is evaluating the program for possible use by districts within SWD.

6.1.2. Use of Automated Data Processing Systems.

6.1.2.1. The USACE HTRW Lessons Learned System is a computer-based system that has been designed to facilitate the exchange of information among multidisciplinary USACE elements with execution responsibilities in the Environmental Restoration arena. This system provides a means to identify real or potential problem areas in the HTRW program, collect ideas on solutions to these problems, and to make the information available to all USACE Commands engaged in this work. The system relies primarily on the electronic transfer of data to identify problem areas and collect corresponding ideas and solutions to distribute to system users. The HTRW Center of Expertise (CX) implements and maintains the system. Engineering and construction personnel use personal computers to access the central file.

6.1.2.2. Architect-Engineer Contract Administration Support System (ACASS) is an automated database of A-E qualifications, DOD A-E contract awards, and A-E performance evaluations. It is maintained and operated by the Contracting Division of the Portland District. ACASS is used primarily by DOD agencies but other Federal agencies may transmit evaluations to ACASS and access information in ACASS. ACASS fulfills Federal Acquisition Regulation requirements eliminating the responsibility for individual offices: to maintain files on firms wishing to be considered for Government contracts; classify each firm with respect to location, specialized experience, professional capabilities and capacity; maintain records on contract awards in the past year; maintain performance evaluation files; and distribute performance evaluations to all contracting offices.

6.1.2.3. Construction Contract Appraisal Support System (CCASS) is a centralized and automated database containing performance evaluation information on DOD construction contractors. The standard form SF 1420, Performance Evaluation – Construction Contracts, is electronically transmitted to the CCASS central database, which is maintained in Portland, Oregon in accordance with criteria established in DFARS 236.201. This software program is designed to assist the construction field office in preparing the Standard Form 1420 and electronically distributing the forms to the District office and the centralized database.

6.2. Information Systems Modernization Program (ISMP). The Corps of Engineers has a multi-year management effort underway to replace outmoded software and applications. It is a commitment to improve the business processes and the automation, which are at the heart of our mission. The HQUSACE Information Systems Modernization Program (ISMP) is composed of several systems (described below) including Corps of Engineers Financial Management System (CEFMS), Program and Project Management Information System (PROMIS), and Resident Management System (RMS). The ISMP evaluates all major software systems used by the Corps of Engineers with the goals of: reducing the cost of data collection; verifying and improving processing; reducing the cost of system design, development, and maintenance; and

improving the accuracy, completeness, availability, timeliness, and usefulness of information for operation users and decision makers at all levels and across all functional boundaries.

6.2.1. CEFMS. Corps of Engineers Financial Management System (CEFMS) is the business management system used by all Corps offices. CEFMS allows the Corps to manage their work, resources, and funding more efficiently by replacing multiple systems previously used such as Corps of Engineers Management Information System (COEMIS). The system provides immediate, real-time responses for commitment, obligation, labor, and other transactions. CEFMS also has the capability to generate reports regarding funding expenditures. Electronic signature capability allows managers to convey their approval or authorization quickly and securely. The CEFMS environment has multi-level processing with system to system networking capabilities. The programming and databases are maintained in centralized locations under secure environments. Access to the database information is strictly protected with numerous passwords and other security features.

6.2.2. PROMIS. The Program and Project Management Information System (PROMIS) is the Corps of Engineers standard automated system supporting the business processes of Programs and Project Management. The system consolidates scope, schedule, and costs data provided by the Project Management team to define the total project requirements. This consolidated data is then used as the basis for scope, schedule, and cost negotiations within the Project Management team. PROMIS is designed to be integrated with data residing on other Corps of Engineers Automated Information Systems such as the Corps of Engineers Financial Management System (CEFMS) and Resident Management System (RMS). At present, use of PROMIS within USACE is in the early stages of implementation.

6.2.3. RMS. The Resident Management System (RMS) is an automated construction-management/quality assurance information system that is PC-based, LAN-compatible, and primarily oriented to the daily requirements of USACE field-level construction managers. Its primary features include capabilities to support construction project planning, contract administration, quality assurance, payments, correspondence, submittal management, safety and accident administration, modification processing, and management reporting. RMS is seen as a powerful, automated management tool to increase staff productivity and help ensure construction quality of projects. Upon completion of development, RMS has the capability of communicating with other USACE automated information systems such as PROMIS and CEFMS.

7. Project Planning

The U.S. Army Corps of Engineers' (USACE's) goals for site investigation, remedial design, and remediation are to deliver quality investigation, engineering design, and remediation efforts on schedule and within budget without compromise to health and safety. These goals challenge the Division and Districts to continue striving for better, safer, faster, and cheaper completion of work activities and site closeout.

7.1. Health and Safety. SPD and its Districts and contractors develop Site Safety and Health Plans (SSHPs) on the basis of site conditions to protect personnel involved in site activities and

the surrounding community. The plans address all applicable regulatory requirements in accordance with 29 CFR 1910.120(i)(2) – Occupational Health and Safety Administration, Hazardous Waste Operations and Emergency Response; 29 CFR 1926, OSHA, Safety and Health Regulations for Construction; 29 CFR 1926.65, OSHA, Hazardous Waste Site Operations and Emergency Response; U.S. EPA Occupational Health and Safety Manual; USACE Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Waste Activities, ER 385-1-92 (ref. 1.3.4.); and USACE Safety and Health Requirements Manual, EM 385-1-1 (ref. 1.3.13.). The SSHP provides site background discussions and describes personnel responsibilities, protective equipment, safety and health protocols, decontamination procedures, personnel training, emergency response contingency plan, and type and extent of medical surveillance. Accident prevention plans are also incorporated into the SSHP. The plans identify problems or hazards that may be encountered and how these are to be addressed. Procedures for protecting third parties, such as visitors or the surrounding population, are also provided. The plans are reviewed and approved by the District/project industrial hygienist and District Safety Office. For in-house work, the Safety Office approves the plan. For contractor work, the SSHP is approved by the contractor and accepted by the Contracting Officer's Representative.

7.2. Technical Project Planning Process. USACE has developed a four-phased effort, called Technical Project Planning (TPP) process, to design data collection programs (ref. 1.3.10., EM 200-1-2, Technical Project Planning (TPP) Process). The TPP process ensures efficient progress to site closeout by challenging the project delivery team to do the following:

- Consider all existing environmental data and site information.
- Understand short- and long-term Customer goals.
- Obtain the Regulator's input.
- Recognize applicable regulations and related decisions required for progress to site closeout.
- Identify the environmental data type(s) needed for the site-specific engineering and scientific evaluations.
- Determine the data quantity and quality requirements based solely on the intended data use(s).
- Develop data collection options for the Customer's consideration.
- Focus on site closeout during all project planning and execution efforts.

The technical project planning (TPP) process involves a number of phase-specific activities. The TPP process supports efforts to prepare project specific DQO statements that meet the definition of a DQO as provided in EPA's 7-Step DQO process (EPA QA/G-4). The 7-step DQO process and the TPP process are the planning tools for Environmental sites within EPA's and USACE's quality management systems, respectively. As planning tools, both processes are intended to ensure data are of the type, quantity, and quality needed for decision making at Environmental Restoration sites. The TPP process is a critical component of the USACE quality management system that meets the American National Standard for planning the collection and evaluation of environmental data (ANSI/ASQC E4). E4 is a national consensus standard for

quality systems responsible for environmental data collection and environmental technology programs.

7.2.1. Phase I (Identify Current Project)

Phase I activities bring together decision-makers and technical personnel to determine an overall site approach and identify the current project focus for the specific product, service, or site activities.

7.2.2. Phase II (Determine Data Needs)

Phase II activities offer guidance to assist "Data Users" with the detailed planning required to identify and document data needed for the current project, and subsequent executable stages at the site. Phase II helps Data Users determine the level(s) or categories of acceptable data quality required for the intended purpose or use of every data need. The required quality of analytical data to be collected is dependent on the data use. The two descriptive data categories employed in this process are screening data with definitive confirmation and definitive data (both as defined by EPA).

7.2.3. Phase III (Develop Data Collection Options)

Phase III efforts of "Data Implementers" develop approaches for sampling and analysis activities that will fulfill the data needs of Data Users, within the constraints of the project.

7.2.4. Phase IV (Design Data Collection Program)

Phase IV activities involve selection of data collection components that best meet the goals for the product, service, project, etc. During this phase, the technical planning team prepares a detailed DQO for each data need, and finalizes related work plans or scopes of work.

Some key concepts of the technical project planning process are:

7.2.4.1. Site Closeout. Site closeout is achieving the "walk away goal", or the final condition of an Environmental Restoration site, as envisioned by the Customer (if there is one), Regulator, and TPP team.

7.2.4.2. Customer's or Sponsoring Entity's Goals. Includes identifying, understanding, and communicating the customer's concept of site closeout and their schedule and budget constraints.

7.2.4.3. TPP Team. Technical project planning teams consist of Decision-Makers, Data Users, Data Implementers, and other project-specific technical specialists needed to achieve the project's goals.

7.2.4.4. Project Objectives. Project Objectives are the short- and long-term issues to be addressed and resolved at an Environmental Restoration site. Satisfying or resolving the

project objectives and the underlying regulations or site decisions are the purpose of all site activities. Most, but not all, project objectives are consequences of the regulations applicable to the site restoration process.

7.2.4.5. Data User Perspectives. Data users are the technical personnel responsible for engineering and scientific evaluations that are the basis for site decisions. Data users determine the data needed to satisfy project objectives.

7.2.4.6. Data Implementer Perspectives. Data implementers (e.g., chemists, engineers, geologists, scientists, etc.) identify the sampling and analysis methods suitable for satisfying the data needs determined by the Data Users.

7.2.4.7. Data Collection Options. Data collection options are different groups of data needs and their associated sampling and analysis methods. Data collection options provide a simple mechanism to document the "basic" data needed for the current project; "optimum" data that is cost-effective and prudent to collect for future executable stages; and any "excessive" data that others, besides the Data Users, impose or mandate in excess of the data needed by Data Users.

7.2.4.8. Data Quality Objectives (DQOs). "DQOs are qualitative and quantitative statements derived from the DQO process that clarify study or project objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that are used as the basis for establishing the quality and quantity of data needed to support decisions" (EPA QA/G4). DQOs produced as a result of the TPP process meet EPA's definition (of a DQO). The DQOs documented during the TPP activities are project-specific statements that describe the data needed, the intended uses of the data, and the sampling and analysis methods to achieve acceptable data quality for the intended data uses. When a Data User defines a probabilistic-type of data need, Steps 5 through 7 of EPA's 7-Step DQO process are used to determine the number of samples required for the intended data uses

8. Implementation of Work Processes for Environmental Data Collection and Construction

8.1. Environmental Data Collection.

8.1.1. Introduction. Execution and implementation of engineering and construction activities of the U.S. Army Corps of Engineers (USACE), including the implementation of our Chemical Data Quality Management (CDQM) program for data collection, in Hazardous, Toxic, and Radioactive Waste contamination related products and services requires the interface and coordination of several USACE personnel. Procedures and responsibilities for USACE staff performing government CDQM activities are defined in this section and detailed in ref. 1.3.12., (EM 200-1-6, Chemical Quality Management for HTRW Projects). Policies, guidance and requirements for geospatial data and systems are defined in ER 1110-1-8156 and EM 1110-1-2909. Geotechnical Data Quality Management guidance is under development and will be contained in an ER upon finalization. Construction activities are discussed briefly (and associated references listed) in some of the sections (8.8.3, 8.10, et al). The respective USACE project

manager (PM) is responsible for initiating and coordinating the defined CDQM activities. The project specific Quality Assurance Project Plan details the chemical data quality management for each project and activities are implemented as described in the plan.

8.1.2. Goals of the CDQM Program. The goals of the USACE CDQM program are to 1) generate data of acceptable quality for the intended use, 2) satisfy the needs of the customer and the regulators, 3) generate sufficient data of known quality on the first attempt, and 4) provide a historical record for potential future use. When CDQM is used properly, the PM can readily measure the success of the project delivery team in meeting the project-specific data quality objectives (DQOs). The USACE CDQM program consists of activities presented in ER 1110-1-263 Chemical Data Quality Management for Hazardous Toxic and Radioactive Waste Remedial Activities (ref. 1.3.7.), Engineer Manual (EM) 200-1-1 Validation of Analytical Chemistry Laboratories (ref. 1.3.9.), EM 200-1-2 Technical Project Planning Guidance for HTRW Data Quality Design (ref. 1.3.10.), and EM 200-1-3 Requirements for the Preparation of Sampling and Analysis Plans (ref. 1.3.11.).

8.1.3. Technical Project Planning. The HTRW Design District (or District to which work is brokered) is responsible for assessment of chemical data quality, including determination of data usability and DQO attainment. The project chemist is a critical team member for this effort, and is involved in preparation and review of project documents including scopes of work, sampling and analysis plans, contract specifications, and final chemical data reports. The project chemist is involved at each step of an environmental restoration project, so that adequate data quality is maintained. The technical project planning process for design of DQOs is discussed in the Project Planning section above and described in detail in EM 200-1-2 (ref. 1.3.10.).

8.1.4. Chemical Data Quality Management (CDQM) Activities. All environmental restoration projects require a comprehensive and multifaceted approach to quality control (QC) and quality assurance (QA) in order to achieve and document attainment of appropriate quality for the intended data usage. The project chemist is the focal point to ensure that chemical data meet data quality objectives for each environmental restoration project. The project chemist has several techniques to monitor and ensure the quality of chemical data. The project chemist in conjunction with the technical project team determines the appropriate level of compliance monitoring as discussed in ER 1110-1-263 (ref. 1.3.7.). This determination is based upon the intended use of the data and the degree of confidence needed in the quality of the data. Monitoring of data quality may consist of a combination of activities. The twelve (12) compliance monitoring activities that the Corps of Engineers apply on a project-specific basis to assist in generating data of known quality are: (1) technical document review; (2) validation of primary and QA laboratories; (3) sample handling quality assurance; (4) quality assurance sample collection and analysis; (5) data review in the form of a CQAR; (6) assessment of data usability in the form of a CDQAR; (7) single- or double-blind performance evaluation sample analysis; (8) review of primary laboratory data; (9) validation of data; (10) field audits; (11) laboratory audits; and (12) tape audits. They are briefly described in some of the ensuing paragraphs and are fully described in EM 200-1-6 (ref. 1.3.12.).

8.2. Technical Document Review. Environmental Restoration/HTRW Project Technical Verification Process. It is the responsibility of the contractor and the District to produce a quality product. Rather than employing multiple levels of detailed document review to ensure quality, the technical verification process transfers project responsibility to the District and its contractors. In general, the HTRW Design District is responsible for a QC review of the prime contractor's Quality Control Plan and all project-specific deliverables. Quality Control Plans, scopes of work, and other project documents completed in-house are reviewed by an independent technical review function established by the Design District. SPD will provide QA oversight of the Districts' QC process. Districts may request HTRW-CX and OE-CX participation in a HTRW Design District's independent technical review process. SPD may request HTRW-CX and OE-CX support in performing QA oversight and audits of the HTRW Design District's QC processes. HTRW-CX review is required on key documents of Category B projects (defined below). The HTRW-CX provides technical assistance and review of any project as requested by the HTRW Design District, MSC, or HQUSACE.

8.2.1. Environmental Restoration/HTRW Project Technical Categories. The HTRW Design District determines the appropriate review process for each environmental restoration project. Category A includes all routine environmental restoration projects, and all projects in the Preliminary Assessment phase and those beyond the Site Inspection (SI) or RCRA Facility Assessment (RFA) phase. Category A excludes, however, National Priorities List (NPL) sites, Base Realignment and Closure (BRAC) sites, sites where innovative technologies are used, and sites with construction estimates greater than $5 million. Category B projects include all non-routine projects, and any projects of special District, Division, or Headquarters (HQ) concern.

8.2.2. Roles and Responsibilities for Review of Specific Environmental Restoration/HTRW Products. Review responsibilities will vary depending on the category (Category A or Category B) of projects. The HTRW Design District is responsible for review and approval of all projects in Category A. Key documents for projects in Category B are reviewed and approved by the HTRW Design District and reviewed by the HTRW-CX. The PM provides appropriate technical documents to the HTRW-CX for their information or review. Technical review by the HTRW-CX will normally be completed within two weeks for a scope of work and within three weeks for all other documents from time of receipt. If shorter review times are required, the PM coordinates with the technical liaison at the HTRW-CX. Comments from the HTRW-CX are provided to the PM for all projects reviewed. A copy of all review comments and responses is placed in the permanent project file. Districts/centers with insufficient staff resources to provide in-house review rely upon the Design District, the Chemistry Quality Assurance Branch Laboratory (CEERD-EE-Q) or the HTRW-CX for document review. In addition, Chemical Quality Assurance Reports and Chemical Data Quality Assessment Reports (ref. 1.3.12.) for all projects are sent to the HTRW-CX. The HTRW-CX is responsible for review of 10% of reports received. Review summaries of the reports are sent monthly to Headquarters (Military Programs) by the HTRW-CX.

8.3. Validation of Primary and QA Laboratories. In general, commercial and QA laboratories that support the SPD Environmental Restoration programs will obtain a USACE laboratory validation prior to field studies or sample analysis. The QA laboratory is defined as the USACE

validated chemistry laboratory that is responsible for analysis of the project QA samples. For some data uses, other programs (i.e., State Fuel Storage Tank Program, A2LA, NELAP, United States Navy, and United States Air Force Installation Restoration Program Audits) can be utilized. Projects are not to be implemented without laboratory accreditation from some authority. Validation is maintained throughout the duration of the project. The USACE laboratory validation program is project-specific. The validation is a parameter, method, and matrix-specific approval. For each new contract or delivery order awarded during the validation period, a project-specific request for validation is sent to the HTRW-CX for verification of laboratory status regardless of their expiration date on the list of validated laboratories. The primary objectives of the USACE validation program are to communicate to laboratories the USACE QA/QC requirements, verify that the laboratories are performing specified analytical methods, and to ensure that these laboratories meet the USACE requirements prior to sample analysis. Laboratory validations are performed by the HTRW-CX applying guidance outlined in EM 200-1-1. The USACE validation program is primarily based on EPA's SW-846 methods. The first step of the validation program is a paper review of the laboratory's capabilities to ensure that the proposed laboratory has the facility, equipment and personnel to perform the project-required analyses. The laboratory demonstrates capabilities by providing acceptable Standard Operating Procedures (SOP) and successfully analyzing project required performance evaluation samples. The final step of the validation program is an on-site inspection of the laboratory's facility. Validation can be terminated at any step of the process due to inadequate laboratory documentation, performance, and/or execution.

8.4. Sample Quality Assurance.

8.4.1. Sample Handling Quality Assurance. The QA laboratory provides immediate feedback regarding problems with sample shipments. The QA laboratory is responsible for checking the sample shipment for temperature, proper preservatives, correct containers etc. The contract laboratory coordinator, project chemist, or other appropriate technical personnel for the project is then notified within 24 hours regarding the status of the sample shipment via facsimile, electronic mail, or telephone call. For most projects, this is beneficial because problems are detected and resolved while the sampling team is still in the field. This approach reduces re-mobilizations to the field. The CEERD-EE-Q laboratory, contract QA laboratory, and the contract primary laboratory complete and report a "Cooler Receipt Form" for all shipments sent to their respective laboratory. An example cooler receipt form is found in EM 200-1-3. A chain-of-custody record is initiated at the sampling stage and maintained throughout the analysis and reporting stages of the process. Sample reports are easily traceable to chain-of-custody records. All documentation pertaining to sample receipt or analysis is included in the laboratory's data report.

8.4.2. QA Sample Collection and Analysis. QA sample collection and analysis is the main tool to determine that the data generated by primary laboratories is technically valid and of adequate quality for the intended data usage. Based on the needs of the project, a percentage of samples are homogenized (except samples for volatiles testing, which are co-located), split, given unique sample identification, and sent to a primary contract laboratory and to a contract QA chemistry laboratory for analysis. QA sample collection does not have to be performed at the same frequency or rate for all test parameters, on all matrices, during all project phases, nor

for any one type of project. General considerations include: 1) the data use and users as defined by the project-specific DQOs; 2) the total number of samples being generated (e.g., a larger number of total samples collected may lower the percentage of QA samples needed); and 3) the need for statistically significant information from QA sample data. Ideally, the USACE QA sample collection and analysis program is an interactive process whereby the chemistry laboratory in conjunction with the project chemist detects and solves problems as sampling and analysis occurs to ensure that the data generated for the project meets the project DQOs. The "value added" by this program can be divided into two areas, detecting analytical problems and salvaging data usability.

8.4.2.1. Detecting Analytical Problems. A primary function of the CEERD-EE-Q or contract QA laboratory is to analyze samples as prescribed by the project and produce a data package that is reviewed in real-time (at the bench during the time of analysis) for later comparison to the primary laboratory's data. Analysis and comparison of the QA sample data to the primary sample data can reveal problems with primary laboratory data even when all other data quality measurements are in control. A common problem is over-dilution of semi-volatile organic analytes by the contract laboratories. Analysis by the QA laboratory can help in deciding whether this was due to actual matrix effect or due to inadequate sample cleanup by the contract lab.

8.4.2.2. Salvaging Data Usability. When the data comparison shows good correlation between the QA laboratory and primary lab data, this may bolster the credibility and usability of the data generated by the primary laboratory. This is especially true in cases where primary lab data comes under close scrutiny and fails some data quality criteria. Good correlation also reflects consistency in the sampling process, the lack of which can be a major source of error or variation.

8.4.3. Data Review in the form of Chemical Quality Assurance Reports (CQARs). CQARs are prepared by CEERD-EE-Q, contract laboratory coordinator, assigned chemist, or other appropriate personnel. The CQAR documents review of the QA laboratory data and the corresponding primary laboratory data. Data for project samples, QC samples and QA samples are compared, and the impact on the primary laboratory's data is documented.

8.4.4. Assessment of Data Usability in the form of Chemical Data Quality Assessment Reports (CDQARs). The project or assigned chemist prepares CDQARs. The CDQAR documents data usability, DQO attainment, and contract compliance.

8.4.5. Single or Double-Blind Performance Evaluation (PE) Sample Analysis. Another means of testing the analyst's proficiency in identifying and quantifying analytes of interest is the use of single or double blind PE samples. Typically the composition of PE samples is known to the originator, but not to the analyst. In a single blind PE sample, both the originator and the analyst know that the sample is a PE sample. USACE uses single blind PE samples as part of the process to validate laboratories. Double blind PE samples are containerized, labeled, and submitted as project environmental samples. The analyst does not know that the sample is a PE sample; ideally, the PE sample is indistinguishable from the other project samples. The use of double blind PE samples is considered a more effective way of detecting problems, since the

laboratory would not be aware that it was being evaluated. However, it is sometimes difficult to disguise a standard reference sample as a project sample. Performance evaluation sample data are evaluated for compound identification, quantitation, and sample contamination. PE samples are recommended for sites that have the potential for a majority of non-detects, or for sites where the contaminants of concern have already been identified. Currently, the complete ranges of organic and inorganic PE samples are available for water only. Selected organic and inorganic PE samples are available for soil.

8.4.6. Review of Primary Laboratory Data. An independent data review of the entire primary data set is performed by the prime contractor for contracted projects. In addition, the project chemist, CEERD-EE-Q chemist, or contract laboratory coordinator (usually a USACE chemist) also reviews a portion of the primary laboratory data. The percentage of primary laboratory data reviewed by the government depends upon the project-specific DQOs. The project chemist, CEERD-EE-Q, or contract laboratory coordinator reviews all the primary laboratory data for in-house projects. Data review is conducted to ensure that: 1) QC data provided in the laboratory deliverables are scientifically sound, appropriate to the method, and completely documented; 2) QC samples are within established guidelines; 3) data were appropriately flagged by the laboratory; 4) documentation of all anomalies in sample preparation and analysis is complete and correct; 5) corrective action forms, if required, are complete; 6) holding times and preservation are documented; 7) data are ready for incorporation into the final report; and 8) data package is complete and ready for data archival.

8.4.7. Validation of Data. Data validation is the process of data assessment in accordance with EPA regional or national functional guidelines or project-specific guidelines. Data validation includes assessment of the whole raw data package from the laboratory.

8.5. Audits. Audits are performed on an unannounced basis, and are coordinated with government geotechnical personnel, as appropriate. Audits are performed during any stage of the project.

8.5.1. Field Audit Procedures. The auditor is responsible for checking that samples are collected and handled in accordance with the approved project plans and for confirming that documentation of work is adequate and complete. Specifically, the auditor ensures that performance of field activities satisfies the project DQOs. Original records generated for all audits are retained within permanent project files. Records may include audit reports, written responses, record of the completed corrective actions, and documents associated with the conduct of audits that support audit findings and corrective actions. Details on contractor quality control of field activities are found in EM 200-1-3. For construction activities, the audit assesses the prime contractor's implementation of the three-phase chemical data control process. Additional information on the three-phase process is found in Corps of Engineers Guide Specifications (CEGS)-01440 and CEGS-01450.

8.5.2. Personnel. Trained and experienced personnel perform the field audits. These personnel are knowledgeable in the subjects necessary for assessing the quality of the work being observed, including thorough knowledge of the contractual requirements. Preferably, field audits are carried out by government personnel but they may sometimes be performed by

contract personnel with some objective relationship to the work being conducted in the field (e.g., a prime contractor auditing its subcontractors). A number of training sessions are available (both internal and external to USACE) to provide the needed understanding of the principles and proper execution of the USACE CDQM program. Division and District staff members avail themselves of this training as appropriate.

8.5.3. Desk Audit of Field Activities. Another mechanism for auditing field activities as they occur is to include government technical review of Daily Quality Control Reports and field logs while the contractor is in the field. Desk audits of field activities require that these reports be supplied on a periodic basis (*e.*g., daily or weekly) to the USACE technical staff. The requirement for periodic reporting is included in the contract specifications or project delivery order, as well as in the project work plans.

8.5.4. Laboratory Audits. The primary and QA chemistry laboratories are responsible for maintaining detailed procedures to support the validity of all analytical work. Laboratory audits may consist of on-site inspections and/or analysis of PE samples. The audit verifies the laboratory's continuing ability to produce acceptable analytical data. These laboratory audits are designed to be project-specific, and may entail a thorough (real-time) review of project chemical data generated by the laboratory. If a performance problem is identified for sample analysis or data reporting, the HTRW-CX reserves the right to audit the laboratory anytime during its 18-month validation. Laboratory audits are carried out on either an announced or unannounced basis.

8.5.5. Tape Audits. The purpose of a raw data review (tape audit) is to assess the quality of the data and to evaluate the overall laboratory performance. This information is then used by the data user to evaluate data quality to make a determination on the acceptability and the usability of the data. The tape audit is designed to independently verify the data reduction practices of an individual laboratory. All of the raw data from a given batch is recalculated by the evaluator and is compared to the results reported by the laboratory. The data quality is measured by laboratory compliance with the required methods and acceptable laboratory practices for analysis and for data reduction. Tape audits can only be performed when a specific analytical instrumental raw data output has been stored electronically. To implement this type of audit the contract requires the laboratory to provide electronic data (*i.e.* magnetic tapes) needed to perform the audit. In addition, a means to read the data and a chemist familiar with both the method and instrument used for data acquisition must be available.

8.5.6. Fraud Deterrence. Although not specifically designed to detect fraud, the USACE QA/QC program of laboratory validation and its maintenance activities, including standard operating procedures review, performance evaluation samples, and on-site inspection of the facility, laboratory data review, and QA sample collection and analysis (the primary laboratory is aware QA samples are being analyzed by a validated QA laboratory), has provided significant assurance and is a deterrent against fraud.

8.6. Primary CDQM Activities. While all twelve of the CDQM activities discussed in the previous sections may be used on a project, six of the twelve are used on most projects. The six primary CDQM activities for USACE HTRW projects are 1) validation of primary and QA laboratories, 2)

technical document review, 3) sample handling quality assurance, 4) QA sample collection and analysis, 5) preparation of Chemical Quality Assurance Reports (CQARs), and 6) preparation of Chemical Data Quality Assessment Reports (CDQARs). These compliance-monitoring procedures are routinely considered as candidates for inclusion in each project's set of CDQM activities.

8.6.1. Documentation of Selected CDQM Activities. The CDQM activities selected for each project are documented in the project-specific DQOs. A recommended procedure for documentation of the CDQM process is presented in American National Standard, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4, 1994).

8.6.2. Waiver of CDQM Activities. USACE Environmental Restoration / HTRW policy allows for any aspect of the program to be waived except for the following three requirements: (1) use of the technical project planning process culminating in project-specific DQOs; (2) use of analytical service providers with verifiable quality systems compliant with the principles of International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Guide 25; and (3) program and project execution in accordance with the requirements of ANSI/ASQC E4 as specified in ER 1110-1-263 Section 8.b (ref. 1.3.7.). ER 1110-1-263 states that all other CDQM elements may be waived for a specific project by the District PM with concurrence from the technical project team as defined in EM 200-1-2 (ref. 1.3.10.). The intent of ER 1110-1-263 is to provide a flexible CDQM program that produces data of known quality to satisfy the project-specific DQOs.

If the project chemist in conjunction with the PM and technical project team decides not to use all of the six primary CDQM elements discussed above, a memorandum for record (MFR) is required. The District PM documents in the MFR what procedures will replace the waived compliance monitoring activity and demonstrate the concurrence of the technical project team including the project chemist. The project chemist will typically be tasked by the PM to prepare this documentation. The MFR includes the PM's signature and the project team's concurrence along with the following elements: 1) brief description of the project; 2) summary of the project objective; 3) description of the waived CDQM activities; and 4) description of alternate procedures to ensure data quality. Districts with insufficient staff chemist resources to provide technical team support rely upon the HTRW Design District, the CEERD-EE-Q professional staff, or the HTRW-CX for chemistry support.

8.7. Use of QA Samples by Project Phase. The use of QA and QC samples is a particularly powerful tool for maintenance of data quality. With primary, QA and QC data for a single sampling point one may perform both inter-laboratory and intra-laboratory data comparisons. In addition, QA samples may provide unique indications about the quality of the primary laboratory's data. The following sections describe the use of QA samples in various project phases.

8.7.1. Investigative Phase. The use of QA samples during the investigative phase adds value by verifying the analytes of concern and quantifying the levels of contamination. In general, QA samples are targeted in locations of known or expected contamination. If the primary and QA

laboratory data are comparable, then this provides an additional level of confidence that the correct action was taken. If the primary laboratory data do not compare well with the associated QA laboratory data, then this causes the data from the site to be more completely evaluated prior to a decision. In addition, the QA laboratory data yields information regarding the spatial heterogeneity of the soil contamination.

8.7.2. Pre-Design Phase. The pre-design phase consists of bench and pilot scale studies. If data generated from these activities are used to size the system, accuracy of results is critical. Any false positive or false negative from the bench or pilot study could result in costly changes following construction of the completed system. QA sample collection provides a verification of the prime contractor's results for use in their design.

8.7.3. Remedial Action Phase. The remedial action phase consists of treatment system analytical support. Verification of results from the actual treatment operations is a critical check for long-term operation of the system. QA samples would be useful during the early stages of the project when the system is optimized or at stages of major equipment changes. Many treatment systems focus on discharge quality and verification of the results aids in the acceptability by the regulators.

8.7.4. Post-Remedial Action Monitoring. The post-remedial action phase typically includes post-excavation confirmation sampling and/or treatment system analytical support. QA sample checks on post-excavation samples can bolster regulator's confidence in the effectiveness of remediation. Analytical support during the operation and maintenance (O&M) phase can last up to 30 years in the case of long-term monitoring. In all likelihood, the primary laboratory would change several times during the course of a long-term monitoring project. Use of the same QA laboratory would be instrumental in providing continuity from one laboratory’s results to another and for resolving problems that inevitably arise when a large volume of data is collected over a long period of time.

8.7.5. Omission of QA Samples. For certain projects, QA samples may not be the best method of ensuring attainment of data quality objectives. The decision to omit QA samples for a given project is made by the project chemist in conjunction with the PM and technical project team. Omission of QA samples is based on meeting project objectives and goals, rather than simply to reduce cost. The project chemist balances the need to maintain quality with the need to perform work for a reasonable cost. The project categories that may not be good candidates for QA sample collection are described below.

8.7.5.1. Underground Storage Tank (UST) Removals. Samples collected to meet state or federal requirements pertaining to UST removals may omit QA samples if regulatory deadlines preclude the QA process.

8.7.5.2. Lead Paint Testing. Construction building material and debris sampling to test for leaded paint is not generally considered to be Environmental Restoration work. Samples of building materials or debris collected solely to test for the presence of leaded paint will not typically benefit from use of QA samples.

8.7.5.3. Asbestos Testing. Construction building material and debris sampling to test for asbestos is not generally considered to be Environmental Restoration work. Samples of building materials or debris collected solely to test for the presence of asbestos will not typically benefit from use of QA samples.

8.7.5.4. Process Monitoring. Samples collected to demonstrate the day-to-day efficacy of intermediate steps during a treatment process would not typically employ QA samples. However, collection of QA samples from the treatment system influent and discharge locations is recommended on an occasional basis.

8.7.5.5. Waste Characterization. Samples collected of drummed materials, tank contents, barrels, and similar materials for hazardous waste profiling do not usually employ QA samples.

8.7.5.6. Treatability Studies. Samples collected as part of a treatability study to demonstrate the efficacy of a remedial process do not usually employ QA samples. QA samples are recommended for optimization studies.

8.7.5.7. Air Samples. Samples collected as part of an ambient air monitoring program usually do not employ QA sample collection. Specifically, this would apply to co-located air samples for both gas phase and particulate related components since co-located samples are not homogeneous. Gas phase samples collected with a split-sampling device are likely to be homogeneous, and QA samples may provide added value.

8.7.5.8. Wipe Samples. Wipe samples (*i.e.* for PCB analysis, metals, etc.) will not usually benefit from QA sample collection since co-located wipe samples are not identical.

8.7.5.9. Non-routine Methods. Certain methods are experimental, or laboratory-specific, and it is not possible to replicate them in a QA laboratory. If duplication of the method is difficult, QA samples are not usually employed.

8.7.5.10. Screening Data. Samples collected as part of a screening program usually do not employ QA sample collection. This would include screening data generated from immunoassay test kits, x-ray fluorescence, colorimetric, or field gas chromatography analyses.

8.8. Procedures for CDQM and Construction Quality Management by Project Phase. The following paragraphs outline the procedures for chemical data quality and construction quality management for the investigative, pre-design and design, and remedial or removal action phases of the USACE Environmental Restoration program. The outlined activities demonstrate use of the six primary CDQM activities described earlier in Section 8.6. and in the technical document review process for Category A projects described in Section 8.2.

8.8.1. Investigative Phase. The investigative phase consists of site characterization, engineering analysis, risk assessment, potentially responsible party (PRP) data gathering, and regulatory analysis. The investigative phases from the CERCLA process are the Preliminary Assessment/Site Inspection (PA/SI) and the Remedial Investigation/Feasibility Study (RI/FS). The investigative phases from the RCRA process are the RCRA Facility Assessment (RFA),

RCRA Facility Investigation (RFI) and the Corrective Measures Study (CMS). For non-time critical removal actions, a PA/SI is performed initially and is followed by an Engineering Evaluation/Cost Analysis (EE/CA). The EE/CA takes the place of the RI/FS. The HTRW Design District writes the scope of services. For Category B projects (see paragraph 8.2.1.), the HTRW Design District submits scope of services to HTRW-CX for review. The HTRW Design District solicits prime contractor services, negotiates, and awards the contract or delivery order. The prime contractor identifies primary laboratory to the District. The PM, project chemist, project engineer, or other appropriate technical personnel for the project requests validation of the primary laboratory by the HTRW-CX via electronic mail or facsimile.

8.8.1.1. The HTRW-CX follows the process described in EM 200-1-1 (ref. 1.3.9.) to validate the laboratory. If the laboratory has not previously been validated by the HTRW-CX, the project chemist screens the laboratory to determine if its technical capabilities merit validation. Depending on the laboratory's validation status, some or all of the following procedures may be omitted. If requested by the HTRW-CX, the primary laboratory submits its Laboratory Quality Management Manual (LQMM) or Quality Assurance Plan (QAP), a representative standard operating procedure (SOP); to demonstrate the laboratory has the capability to run the required methods, and petroleum hydrocarbon SOPs (if necessary) to the HTRW-CX. Based on satisfactory review of the QAP and SOPs, performance evaluation samples are sent if available. The laboratory is then inspected by HTRW-CX. Personnel from the HTRW Design District and CEERD-EE-Q may assist with this process. If the laboratory fails to become validated, another laboratory is selected.

The prime contractor submits the Sampling and Analysis Plan (SAP), consisting of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP), for HTRW Design District review and approval. Other environmental regulatory programs may require different documentation than a SAP. For Category B projects (see paragraph 8.2.1), the HTRW Design District sends the SAP to the HTRW-CX for review, the HTRW-CX provides recommendations for improvement back to HTRW Design District.

From the SAP, the HTRW Design District or the CEERD-EE-Q makes an estimate of the cost of QA sample analysis. The budgeted amount is funded by the HTRW Design District to the CEERD-EE-Q, contract laboratory coordinator, or contract QA laboratory prior to sending samples for QA analysis. The HTRW Design Districts provide the CEERD-EE-Q, contract laboratory coordinators, and/or contract laboratories with the following information: 1) project name; 2) approximate sampling dates; 3) number of samples; 4) matrix (matrices); 5) analyses; 6) DQOs; and 7) turnaround time.

8.8.1.2. Fieldwork begins after the HTRW Design District approves the SAP and the technical team leader or project chemist coordinates with the prime contractor for (commencement of) field and laboratory activities. Samples are collected in the field with project and QC samples shipped to the primary laboratory and QA samples shipped to a different laboratory. QA laboratory support is available to the Districts from the Chemistry Quality Assurance Branch Laboratory (CEERD-EE-Q) located in Omaha, NE. The CEERD-EE-Q is aligned with the Environmental Laboratory at WES located in Vicksburg, MS. Technical project planning teams determine the best course of action to obtain QA laboratory functions using either the CEERD-

EE-Q or a contract laboratory. All laboratories selected for use have been currently validated by the HTRW-CX validation procedure and are subject to audit at any time as previously discussed.

The primary laboratory and the CEERD-EE-Q laboratory (or contract laboratory coordinators) are notified upon final shipment of project samples. The prime contractor's analytical results are submitted to the HTRW Design District within the time frame identified in the contract. The analytical results that correlate with the QA samples are sent to the CEERD-EE-Q (or contract laboratory coordinators) at the same time. A CEERD-EE-Q chemist (a project chemist, or a contract laboratory coordinator) prepares the Chemical Quality Assurance Report (CQAR) and submits it to the HTRW Design District and the HTRW-CX. The HTRW Design District provides the CQAR to the prime contractor for inclusion in the project report.

The prime contractor prepares the draft project report and submits it to the HTRW Design District. The project report includes the CQAR, as well as the contractor's assessment of the primary laboratory data. The report is reviewed by the same office(s) that reviewed the SAP. The project chemist writes the Chemical Data Quality Assessment Report (CDQAR) or an equivalent report addressing data usability and DQO attainment from information received from the prime contractor and the CQAR. CDQARs (or an equivalent report) are prepared for all in-house and contractor executed projects. CQARs and CDQARs are sent to the HTRW-CX for all projects.

8.8.2. Pre-Design and Design Phase. The pre-design and design phase of the Environmental Restoration program consists of remedial action selection and design. The CERCLA design phase is remedial design (RD). The corresponding RCRA phase is called the corrective measures design (CMD). The following outline applies when the design is prepared by a contractor. Modifications are required if the design is performed in-house.

8.8.2.1. Design District writes scope of services. For Category B projects (as discussed earlier in Section 8.2.), the HTRW Design District submits scope of services to HTRW-CX for review. The HTRW Design District solicits prime contractor services and also negotiates and awards prime contractor design contract or delivery order. If investigative activities are included in the design contract, steps discussed above in the investigative phase (Section 8.8.1.) are followed.

The prime contractors submit design analysis reports that contain a section that specifically addresses chemical quality management concerns. The prime contractor also submits plans and specifications, which include chemical quality management at the preliminary, intermediate, and final phases. For the Total Environmental Restoration Contract (TERC), the prime contractor submits a Work Plan for each delivery order. These documents are submitted, by the prime contractor, to the HTRW Design District for approval. The chemical section of the plans and specifications or work plan gives the construction contractor instructions for writing the SAP in addition to including all necessary site-specific chemical detail. For Category B projects, the HTRW Design District submits these documents (to include the design analysis, plans and specifications, and the work plan) to the HTRW-CX for technical review, and comments are sent back to the HTRW Design District.

The HTRW Design District assures that appropriate comments are addressed and incorporated into the documents. Revised documents and annotated comments are sent to the offices generating comments at the next submittal stage. Final (100%) plans and specifications are approved by the HTRW Design District. From the contract specifications, a preliminary estimate is made of the funding required to support specified QA activities. The District awards the construction contract.

8.8.3. Remedial or Removal Action Phase. Many construction offices do not have sufficient chemistry training to make the decisions necessary to support the HTRW program. These construction offices rely on basic chemistry support from resources at their HTRW Design District, CEERD-EE-Q, or the HTRW-CX. Several guidance documents integrate chemical data quality assurance for remedial actions into existing QA procedures for construction, including: ER 415-1-10, Construction Contractor Submittal Procedures (30 May 1995); ER 415-1-302, Construction Inspection and Work Records (30 December 1993); ER 1180-1-6, Construction Quality Management (30 September 1995); EP 715-1-2, A Guide to Effective Contractor Quality Control (01 February 1990); CEGS 01440, Contractor Quality Control (October 1994); and CEGS 01450, Chemical Data Quality Control (November 1994).

The District representative requests validation of the primary laboratory by the HTRW-CX via electronic mail or facsimile that initiates the process and procedures for laboratory validation. The designated HTRW Design District, CEERD-EE-Q laboratory, or HTRW-CX (depending upon which organization is providing the basic chemistry support for the project) assists the Construction District in reviewing the SAP and makes recommendations to the construction District. The Construction District approves/disapproves the prime contractor's SAP. Construction begins after SAP and prime contractor's laboratory is approved. The laboratory is subject to audits as previously discussed.

8.8.3.1. The construction representative coordinates with the prime contractor for field and laboratory activities. QA samples are sent to the contract QA laboratory or CEERD-EE-Q laboratory throughout the duration of the sampling effort or as defined by the contract specifications. The prime contractor notifies the primary laboratory and the CEERD-EE-Q laboratory or contract QA laboratory when the final project samples have been sent. The prime contractor's analytical results are submitted to the construction office for transmittal to the CEERD-EE-Q laboratory (or contract laboratory coordinator) or project chemist within the time frame identified in the contract. The CEERD-EE-Q chemist, contract laboratory chemist, or contract laboratory coordinator prepares the CQAR and submits it to the Construction District and the HTRW-CX. The Construction District provides the CQAR to the prime contractor for inclusion in the project report.

The prime contractor submits the project report to the Construction District. The project report includes the CQAR, as well as the contractor's evaluation of the primary laboratory data. The construction representative reviews the report with assistance from the HTRW Design District, CEERD-EE-Q, or HTRW-CX staff, as requested. The Construction District writes the CDQAR addressing contract compliance, data usability and DQO attainment from information provided by the construction contractor and the CQAR. CDQARs are sent by the Construction District to the HTRW-CX for all projects.

8.9. Data Management and Archival Process. The prime contractor and laboratories are responsible for generating, controlling and archiving laboratory and field records for all projects. This information is maintained with a system that is effective for retrieval of any documentation that affects the reported results. The PM or technical team leader determines whether supporting data is to be transferred from the prime contractor to USACE upon contract completion or whether the prime contractor is to be responsible for archiving the data. This includes record generation and control, security, and maintenance of all project related documents. The duration of laboratory data and field record retention is specified as part of the project DQOs.

8.9.1. Laboratory. The laboratory prepares and retains full analytical and QC documentation that allows sample tracking from initiation to disposal. The following minimum records are stored for each project: 1) original work order, chain-of-custody, and other pertinent documents received with the samples, 2) communications between the laboratory, field, and the customer, 3) any associated corrective actions, 4) laboratory data packages, 5) finalized data report, 6) laboratory log books, and 7) electronic data. The laboratory also maintains its QAP and relevant SOPs for the methods performed.

8.9.2. Field. Project-specific records that relate to field work performed are also retained. These records may include correspondence, chain-of-custody records, field notes, and reports issued as a result of the work. In addition, records that document all field operations are retained. This may include equipment performance records, field log books, drilling logs, maintenance logs, personnel files, general field procedures, and corrective action reports. For field operations hard copy records are acceptable.

8.10. Construction Management. The Corps of Engineers' philosophy for quality management in construction is outlined in ER-1180-1-6, Construction Quality Management. Obtaining quality construction is a combined responsibility of the construction contractor and the government. Their mutual goal is a quality product conforming to the contract requirements. QA is required on all construction contracts. The contractor controls the quality of the work and the Government, in a separate but coordinated effort, assures that the level of quality set by the statement of work or plans and specifications is achieved.

8.10.1. Contractor Quality Control (CQC). CQC is the system by which the contractor bears responsibility for all activities necessary to manage, control, and document work to comply with contract plans and specifications. The contractor's responsibility includes ensuring adequate quality control services are provided for work accomplished on-site and off-site by his/her organizations, suppliers, subcontractors, laboratories, and technical consultants. The work activities include safety, submittal management, and all other functions relating to the requirement for quality construction. Prior to the start of work, the contractor prepares a CQC plan indicating staff organization, control of materials, installation techniques, and conformance testing. The original submission of this plan applies to all contract work and is effective for the life of the project. Further information on the interrelationship between the CQC and quality management is contained in the EFARS.

On receipt of the CQC plan, the field engineer reviews the plan to verify conformance with the CQC contract provision. All increments of the CQC function must be addressed with the intention of presenting a complete plan, and the field engineer's review compares and evaluates each of its features against the specified requirements. The following are key points typically checked as part of this review:

- The name, qualifications, and delegated authority of an officer of the corporation responsible for the project.
- Procedures for managing material submittals, including those of subcontractors.
- Control testing procedures for each specific test required in the contract, including laboratory facilities.
- Reporting procedures centering on the three-phase inspection of construction, including proposed reporting formats.

The Contracting Officer's Representative (COR) provides a prompt written response to the contractor accepting the CQC plan as submitted or with specified changes subject to satisfactory performance. A contractor's concurrence with exceptions may be required before start of work. After acceptance of the CQC plan, the contractor notifies the COR in writing of any proposed change. Proposed changes are subject to acceptance by the COR.

8.10.2. Government Quality Assurance. The quality assurance process starts well before construction and may include a number of related activities. These activities include reviews of the plans and specifications for biddability, constructibility, operability, and environmental responsibility; plan-in-hand site reviews; coordination with using agencies or local interests; establishment of performance periods and quality control requirements; field office planning; preparation of QA plans; reviews of QC plans; participation in design review conferences; enforcement of contract clauses; maintenance of QA/QC inspection and work records; establishing CQC requirements; etc. performed prior to the start of construction. (Note. Many of these activities may not be applicable to cost-reimbursement work.)

ER 1180-1-6 requires that the field engineer develop a written QA organization plan that addresses the overall QA operations of the field office. After initial development, the plan will be reviewed and updated as often as necessary, but not less than annually. Supplements incorporating project specific requirements should be developed for those contracts with unique requirements not covered in the basic plan.

The QA plan includes:

- The field's QA organization.
- Procedures for reviewing contractor submittals, quality control reports, and test results.
- Procedures for surveillance of CQC activities.
- Procedures for reviewing CQC reports.
- Procedures for reporting construction deficiencies and following up to assure correction.
- Procedures to assure that the contractor submit all items required by the contract, particularly repetitive items, and

- Procedures for sampling, testing, and QA inspection by Government personnel.

A suggested outline for the QA plan in found in ER 1180-1-6. In accordance with ER 1180-1-6, the field engineer conducts a CQC/QA coordination meeting for detailed planning of activities of Government and contractor quality construction elements. Minutes of this meeting are prepared. On small contracts this meeting may be a part of the pre-construction conference. QA efforts at the inception of each phase of work are particularly effective, since corrective actions are easier to implement at this stage.

The main duty of Quality Assurance Personnel, through monitoring of CQC operations, is to assure that the work is being performed in accordance with the plans and specifications and that the CQC system is functioning effectively. To accomplish this, QA personnel (a) study the plans and specifications in advance, (b) anticipate problems and requirements, (c) perform necessary investigations on a phase of work well in advance of work commencement, and (d) obtain the COR's approval of shop drawings before materials are brought on the job.

QA personnel should be informed that assistance and advice is provided to them, whenever it is needed. Immediately available to them is a copy of the plans and specifications, including all necessary reference material, amendments, revisions, and modification; approved shop drawings for material on the job; applicable volumes of the Construction Inspector's Guide; a copy of EM 385-1-1, Safety and Health Requirements Manual; a copy of the contractor's accident prevention plan; a copy of the CQC plans; site specific safety and health plan, including the enclosed Activity Hazard Analysis Program; daily log reports or books; and camera, rules, tapes, and other measuring devices of testing equipment as required to check the various items of work for which the QA personnel are responsible. The field engineer prepares a QA plan for the office. After initial development, the plan will be reviewed and updated as often as necessary, but not less than annually. Supplements incorporating project-specific requirements will be developed for those contracts with unique requirements not covered in the basic plan. The plan states, in detail, how the CQC activities will be monitored, responsibilities and authority of QA personnel, types of inspections to be performed by QA personnel, methods to be used for inspections performed by the Government, and specific steps to assure compliance of the work with the plans and specifications.

8.10.3. Three-phase control concept. The field engineer ensures that CQC inspections are performed at the outset of each new phase or segment of construction. Preparatory inspections prior to physical work placement ascertain that materials comply with specification and/or approved submittal documents. Initial inspections occurring at the outset of work placement establish and achieve workmanship standards at the beginning of each construction phase. Government participation in preparatory and initial inspections is highly desirable. Follow-up inspections on a daily or routine basis are more productive when preceded by joint contractor/USACE preparatory and initial inspections. Preparatory and initial inspections are performed with checklists to ensure thoroughness. All phases of inspections are documented. It should be kept in mind that the contractor is responsible for conducting these inspections, while the Government is responsible only for assuring they are conducted, are adequate for the purpose, and are properly documented.

8.10.4. Deficiencies in contract performance. The field engineer is on the alert for deficiencies and their prompt correction. Upon detection of a deficiency, the contractor is first informed verbally and, where necessary, the verbal notification is immediately confirmed in writing. Additionally, the USACE representative makes a descriptive entry on the daily QA report and the field engineer insists that a like entry be made by the contractor on the daily CQC report. The District is promptly informed of any refusals by the contractor to correct a deficiency. A complete record is kept of facts relating to the deficiencies in contract performance and efforts to correct them. A number of different remedies are available to the Government, depending on the type of deficiency and the type of contract.

9. Assessment and Response

9.1. Quality Management Reviews. To assure that the quality requirements are met, HQUSACE, in coordination and cooperation with SPD, may conduct quality management reviews. These reviews are made to assess the effectiveness and implementation of individual USACE command's quality management plans. The reviews are accomplished in a stand-alone mode or in conjunction with other command inspections/reviews (i.e., command inspections, Engineer Inspector General inspections, etc.). The Director of Programs Management at SPD will periodically review their own as well as their executing organizations' implementation of the USACE PMBP to evaluate the effectiveness of their quality assurance, efficiency, and execution. Executing organizations (i.e., Districts, FOAs, Laboratories, etc.) shall periodically assess their project and program management processes and practices to ensure effective implementation of the plan requirements.

9.2. Division and CX Audit Responsibilities. SPD, with requested support from the HTRW and/or OE CXs, selectively audits or reviews the QC processes in the Districts. This includes meeting periodically with Districts to review their quality control processes through evaluation of selected products and services at various stages of development to assure compliance with the QMP and to assess their quality. These reviews also help to identify system problems, trends, and improvements (when needed) to the quality management and quality control process, and to assure compliance with current SPD, and HQUSACE policy. The selection of products for detailed audits is based on a number of criteria, including the expressed needs and concerns of the District, new processes or techniques, or product types that have poor performance histories. Determinations of the need for such audits are made at any time during product development.

9.2.1. Audit Process. The audit process may take many forms, including those discussed in Section 8 of this Enclosure. Upon determination that a formal audit of a quality management process is desirable, it shall consist of the following: (1) Letter notification to District Commander identifying need for QC audit, studies/projects to be audited, specific data required for audit (see general data requirements, below) and audit process and schedule specific to the identified studies/projects; (2) Review by QA team of project data provided by District; (3) Counterpart discussions (on an as needed basis); (4) Full audit of project documents (if determined necessary by QA team); and (5) Outbrief/report on the Quality Management of the project to the Chief of the functional element responsible for the technical product being audited and the District Commander.

9.2.2. General Data Requirements for Formal Audit. The data required for a specific study/project generally shall include the following: Brief description of the overall study/project and each activity related thereunto; QCP for study/project; Minutes of the Technical Review Strategy Session; Comments made by the Independent Technical Review Team during both seamless and product specific reviews; Memoranda documenting resolution of ITRT comments; and list of products generated.

9.3. Data Assessment. Anytime chemical data is generated, the quality is assessed prior to use. The type and degree of assessment required depends upon the project data quality objectives. Several different levels of data assessment exist, including data verification, data review, data evaluation, and data validation.

9.3.1. Data Verification. Data verification, the most basic step in data assessment, is a process for evaluating the completeness, correctness, consistency, and compliance of a data package against a standard or contract. In this context, "completeness" means that all required hard copy and electronic deliverables are present. Data verification is performed by the CEERD-EE-Q or contract laboratory coordinator for QA laboratory deliverables and by the laboratory contract holder for primary laboratory deliverables.

9.3.2. Data Review. Data review is the next step in the data assessment hierarchy. Data review is the process of data assessment performed to produce the chemical quality assurance report (CQAR). Data review includes an assessment of summary QC data provided by the laboratory. Data review may include examination of primary and QA laboratory data and the internal quality control and QA sample results to ascertain the effects on the primary laboratory's data.

9.3.3. Data Evaluation. Data evaluation is the process of data assessment done by project chemists to produce a chemical data quality assessment report (CDQAR). Data evaluation is performed to determine whether the data meet project-specific data quality objectives (DQOs) and contract requirements. To prepare a CDQAR, the project chemist relies upon the DQO summary from the Sampling and Analysis Plan, the CQAR, field oversight findings, laboratory audits, performance evaluation sample results, and any other data quality indicators available.

9.3.4. Data Validation. Data validation is required for certain projects. Validation is a process of data assessment in accordance with EPA regional or national functional guidelines, or project-specific guidelines. Data validation includes assessment of the whole raw data package from the laboratory.

9.3.5. Special Requirements. Often, the requirements for data assessment will depend upon the project phase. In particular, data for use in a risk assessment will have specific quality requirements. There are several excellent references on this topic, including Chapter 3 of EM 200-1-4, ["Risk Assessment Handbook: Volume I, Human Health Evaluation", USACE 1995 and Volume II Environmental Evaluation, USACE 1996]; and "Guidance for Data Usability in Risk Assessments (Parts A and B) [Office of Emergency and Remedial Response, EPA Directive 9285.7-09A, 1992].

9.3.6. Required Level of Data Assessment. The degree of data assessment is different for screening level data than for definitive data. Screening level data are typically characterized by less stringent QA/QC procedures. Assessment of screening level data consists of checking whatever QA/QC indicators are available, and confirming the results with definitive analyses, usually at a 10% frequency.

9.3.7. Assessment of Definitive Data. Definitive data are characterized by rigorous QA/QC procedures. The following set of general procedures is applied to the extent possible for all definitive data sets.

9.3.7.1. Data Verification. Definitive data assessment begins at the primary and quality assurance (QA) laboratories. General processes for data quality management at the laboratory are described in EM 200-1-1 as well as EM 200-1-3. Once the data have met the laboratory's standards, data verification is performed to determine if the data package is correct and complete.

9.3.7.2. Data Review. Definitive data review is then performed. See ref. 1.3.12, for more details on the specifics of data review. The data review process documents possible effects on the data that result from various QC failures. It does not determine data usability, nor does it include assignment of data qualifier flags.

The initial inspection of the data screens for errors and inconsistencies. The chemist checks the chain of custody forms, sample handling procedures, analyses requested, sample description and identification, and cooler receipt forms. The chemist then verifies that the data were checked by the laboratory manager or quality assurance officer. Sample holding times and preservation methods are checked and noted.

The next phase of data quality review is an examination of the actual QC data. By examining data from laboratory matrix duplicates, blind duplicates, trip blanks, PE samples, equipment blanks, laboratory method blanks, laboratory control samples (LCSs), LCS duplicates (LCSDs), matrix spike (MS) samples, matrix spike duplicate (MSD) samples, surrogate recoveries, and field samples, the chemist can determine whether the data are of acceptable quality.

Both laboratory control samples and matrix duplicates are examined during data review. The precision of the data is quantified by the relative percent difference (RPD) between two results obtained for the same sample. The samples are either internal laboratory QC samples (*i.e.*, laboratory control samples) or field samples. A high RPD in an LCS/LCSD pair is an indication of overall method failure, and may result in the rejection of an entire data set. Laboratory matrix duplicates and matrix spike duplicates are also assessed by their RPD values. High RPD values for matrix duplicates indicate a lack of reproducibility, and such data are qualified or rejected. Any such results are noted in the assessment of data quality.

Data from blank samples are examined to determine if sample contamination occurred either during or after the sample collection. Equipment or rinsate blanks consist of reagent water passed through or over sampling equipment following sample collection and sample equipment decontamination. Contaminated equipment blanks indicate inadequate decontamination

between samples, and the strong likelihood of cross-contamination between samples. Method blanks are blank samples prepared in the laboratory and analyzed along with project samples. If analytes are detected in a method blank, it is a strong indication of laboratory contamination. This would raise the possibility that project sample aliquots were contaminated in the laboratory as well. Trip blanks are samples of reagent water that accompany the project samples from the field to the laboratory. Trip blanks accompany each shipment of water samples to be analyzed for volatile organic compounds. Analysis of the trip blanks indicates whether sample contamination occurred during shipment and/or storage.

Surrogate recoveries are scrutinized to ensure they fall within an acceptable range. Adequate surrogate recoveries in QC samples (blanks and LCSs) indicate that sample extraction procedures were effective, and that overall instrument procedures were acceptable. Surrogate recoveries in field samples are a measure of possible matrix effects and can indicate complete digestion or extraction of a sample. Surrogate recoveries outside control limits may result in qualified or rejected data.

A laboratory control sample (LCS) is an aliquot of a clean matrix (*i.e.*, clean water or sand) that contains a known quantity of an analyte. Good recoveries from an LCS indicate that the analytical method is in control and that the laboratory is capable of generating acceptable data. The evaluation of possible matrix effects and accuracy of the data are monitored by analysis of matrix spike and matrix spike duplicate samples. A matrix spike sample is prepared by adding a known quantity of an analyte to a field sample. The matrix spike duplicate is prepared in an identical manner. Matrix spike and matrix spike duplicates are analyzed at least once per every twenty samples, or once per batch, whichever is greater. Recovery of the matrix spike indicates the absence of a matrix effect and is another measure of data accuracy. Comparison of the matrix spike and matrix spike duplicate results provides an indication of data precision. All matrix spike and matrix spike duplicate data are examined. Low or high spike recoveries are evidence of matrix effects and poor accuracy; a high RPD for duplicates is evidence of low precision; all such results are reported in the data review.

A blind duplicate quality control (QC) sample is submitted to the primary laboratory, which analyzes the majority of the samples. Analysis of the QC duplicate sample provides a measure of sample homogeneity and intra-laboratory variations. An additional replicate sample is provided to an independent quality assurance (QA) laboratory, to provide a further test of sample homogeneity and a test of inter-laboratory accuracy. QA and QC samples effectively provide triplicate analysis of a subset of the total project samples. The three results for each set are carefully compared and tabulated. (Data comparison criteria for evaluation of data comparability are described in ref. 1.3.12.). If two of three data sets agree, each laboratory's internal QA/QC data are reassessed to determine which set of data is the most accurate. Data from related analyses are inspected to determine which set of data is more accurate.

9.3.7.3. Data Evaluation. Data evaluation follows data review. During data evaluation, the project chemist uses the results of the data review as summarized in the CQAR to determine the usability of the data. The CQAR documents the potential effects of QA/QC failures on the data, and the project chemist assesses their impact on attainment of DQOs and contract compliance.

9.3.7.4. Data Qualifiers. Data assessment results in documentation of the quality and usability of the data. Data qualifiers, called flags, are applied as appropriate to alert the data user of deficiencies in the data. Data qualifiers are applied by the project chemist, taking into account the project-specific data quality objectives. The qualifiers are different depending on the type of data evaluation performed and are defined appropriately within the documentation. Data validation by EPA functional guideline procedures may employ different flags than project-specific validation data qualifiers. Despite the data assessment flags used, the qualifiers serve the same purpose. The flags are used to delimit the usability of the data, generally because of quality control failures.

ENCLOSURE 4
DEFINITIONS USED IN
HTRW & CDQM PROJECTS

Accuracy. The closeness of agreement between the measured value and the true value. Calculated as percent recovery.

Activity. An all-inclusive term describing a specific set of operations or related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication, etc.), that in total result in a product or service.

Assessment. The evaluation process used to measure the performance or effectiveness of a system and its elements.

Audit. A independent, systematic examination to determine whether activities comply with planned arrangements, whether the arrangements are implemented effectively, and whether the results are suitable to achieve objectives.

Bias. The systemic or persistent distortion of a measurement process which causes errors in one direction.

Chain of custody. An unbroken trail of accountability that ensures the physical security of samples, data, and records.

Characteristic. Any property or attribute of a datum, item, process, or service that is distinct, describable and/or measurable.

Comparability. A qualitative characteristic which defines the extent to which a chemical parameter measurement is consistent with, and may be compared to, values from other sampling events.

Completeness. A quantitative evaluation of what percent of the chemical measurements met the project data quality objectives.

Conformance. An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation.

Contractor. Any organization or individual that contracts to furnish services or items or perform work.
Corrective action. Measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

Customer. The owner, client, user, project manager (PM), or beneficiary of a service or product.
Data Assessment. The all-inclusive process used to measure the effectiveness of a particular data gathering activity. This process may be comprised of data verification, data review, data evaluation, and data validation.

Data Evaluation. The process of data assessment done by the district project chemist to produce a chemical data quality assessment report.

Data of known quality. Data that have the qualitative and quantitative components associated with their derivation documented appropriately for their intended use, and such documentation is verifiable and defensible.

Data Quality Assessment (DQA). A statistical and scientific evaluation of the data set to determine the validity and performance of the data collection design and statistical test, and the adequacy of the data set for its intended use.

Data Quality Objective Process. A Total Quality Management (TQM) tool, based on the Scientific Method and developed by the U.S. Environmental Protection Agency to facilitate the planning of environmental data collection activities. The DQO process enables planners to focus their planning efforts by specifying the use of the data (the decision), the decision criteria (action level), and the decision-maker's acceptable decision error rates. The products of the DQO process are the DQOs (See also Graded Approach).

Data Quality Objectives (DQOs). Qualitative and quantitative statements that clarify technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that are used as the basis for establishing the quality and quantity of data needed for support decisions.

Data Review. The process of data assessment performed by the USACE HTRW chemistry laboratory to produce the chemical quality assurance report.

Data usability review. The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

Data Usability. The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

Data Validation. The process of data assessment in accordance with USEPA regional or national functional guidelines, or USACE guidelines, or project-specific guidelines.

Data Verification. The process for evaluating the completeness, correctness, consistency, and compliance of a data package against a standard or contract.

Deficiency. An unauthorized deviation from approved procedures or practices, or a defect in an item.

Definitive Data. Data that are generated using rigorous, analyte-specific analytical methods where analytical identifications and quantifications are confirmed and QA/QC requirements are satisfied.

Design review. A documented evaluation by a team, including personnel such as the responsible designers, the client for the work or product being designed, and a QA representative, but other than the original designers, to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

Design. The process of (1) developing the analyses that define the required technical systems (e.g., environmental, geotechnical, hydraulic, architectural, structural, electrical, mechanical, fire protection, etc.) which will be utilized, (2) producing the technical portions of the construction contract documents (i.e., the drawings and specifications), and (3) preparing the construction or related cost estimate.

Document. Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.

Duplicate sample. A sample replicate collected as near as possible at an identical time and place as an original sample. Sometimes used in place of a split sample for volatile analytes, or to assess overall sample matrix homogeneity (see also split sample).

Engineering. For the purpose this document, the efforts of technical disciplines involved in producing a technical service or product (e.g., a design, engineering feasibility study, geotechnical report, environmental report, design analysis, facility master plan, hydraulics/hydrology analysis, construction cost estimate, etc.).

Entity. Something which can be individually described and considered, such as a process, product, item, organization, or combination thereof.

Feedback. Communication of data quality performance to sources which can take appropriate action.

Field Operating Activities. Five entities within the USACE that assist in policy development and implementation and provide support services to the USACE. They include the Center for Public Works, Finance Center, Humphreys Engineer Center Support Activity, Marine Design Center, and Water Resources Support Center.

Finding. An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative, and is normally accompanied by specific examples of the observed condition.

Functional Elements. Refers to the essential units (and staff) of the organization (i.e., Division, District, MSC, FOA, etc.) responsible for carrying out its mission functions. Mission essential functions are defined and assigned to Divisions and Districts by HQUSACE.
Geographic District. Areas of work assigned to Districts based upon the physical location within the District boundaries and mission.

Graded Approach. The process of basing the level of application of managerial controls applied to an item or work according to the intended use of results and the degree of confidence needed in the quality of the results.

HTRW activities. Activities undertaken for the U.S. EPA's Superfund Program, the Defense Environmental Restoration Program (DERP), including Formerly Used Defense Sites (FUDS) and Installation Restoration Program (IRP) sites at active DOD facilities, Environmental Restoration/HTRW actions associated with Civil Works projects, and any other mission or non-mission work performed for others at Environmental Restoration/HTRW sites. Such activities include, but are not limited to, Preliminary Assessments/Site Inspections (PA/SI), Remedial Investigations (RI), Feasibility Studies (FS), Engineering Evaluation/Cost Analyses (EE/CA), RCRA Facility Investigations/ Corrective Measures Studies/ Corrective Measures Implementation/ Closure Plans/ Part B Permits, or any other investigations, design activities, or remedial construction at known, suspected, or potential Environmental Restoration/HTRW sites. Environmental Restoration/HTRW activities also include those conducted at petroleum tank sites and construction sites containing Hazardous, Toxic, and Radioactive Waste.

HTRW chemistry laboratory. A USACE laboratory which has been designated by CEMP-RT and validated by the HTRW CX to provide analytical services to the HTRW program.

Independent assessment. An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Independent Assessment. An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Inspection. Examination or measurement of an item or activity to verify conformance to specific requirements.

Item. An all-inclusive term used in place of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data.

Management system. A structured non-technical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and for producing items and services.

Management. Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Method. A body of procedures and techniques for performing an activity systematically presented in the order in which they are to be executed.

Nonconformance. A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement.

Observation. An assessment conclusion that identifies either a positive or negative condition.

Ordnance and Explosives (OE) activities. All work undertaken to manage or eliminate the immediate risks associated with OE related material. OE activities are usually response activities undertaken for DERP, FUDS, or Base Realignment and Closure (BRAC) projects. OE responses include site inventories, preliminary assessments, site investigations, public involvement, engineering estimates, cost analyses, action memoranda, removal designs, removals (both time critical & non-time critical), and clean-up of residual OE.

Partnering. Partnering may be defined as “the development and sustainment of a relationship that promotes achievement of mutually beneficial goals”. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of delivered products and services. Partnering is a voluntary relationship that builds upon the good relationship that exists among the professional participants involved in any engineering or design activity. Partnering is further described in ER 1110-1-12 (ref. 1.3.6.).

Precision. A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, expressed generally in terms of standard deviation.

Primary laboratory. Laboratory that analyzes the majority of the project samples.

Procedure. A specified way to perform an activity.

Process. A set of interrelated resources and activities which transforms inputs into outputs.

Program - is a group of projects, services or other activities that may be categorized by funding source, customer requirements or other common criteria for which resources are allocated and collectively managed.

Project Management Plan (PMP). The detailed, specific plan, used to manage and control the delivery of a project from its inception to completion.

Project Manager (PM). The leader of the project delivery team, responsible for managing the project parameters (budget, cost, safety, schedule, scope, and quality), as well as interfacing with those involved in the project process (customers, functional elements, government, and non-government entities).

Project. An organized set of activities within a program (products, services, etc.) intended to produce a specific expected outcome or solution to a customer problem or need. Customer, in this sense, is used in a broad manner and refers to discrete (even localized) entities, organizations internal or external to the Corps and, in some cases, the Nation as a whole.

Quality Assurance (QA). An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement that measures the degree of excellence of and insures that the system is functioning to provide the desired specified product or service.

Quality Assurance Coordinator (QAC). The Division point of contact regarding quality assurance of environmental products and services with responsibility to oversee District products and services and to provide environmental technical assistance to Corps personnel.

Quality assurance laboratory. The USACE HTRW chemistry laboratory, or its subcontracted agent that is responsible for analysis of the project QA samples.

Quality assurance sample. A sample collected to monitor the quality of sampling operations. This type of sample is analyzed by the quality assurance laboratory and typically includes split samples, duplicate samples, and various types of blank samples.

Quality Control (QC). The overall system of technical activities that monitors the degree of excellence provided for the performance of a task that meets the agreed-upon requirements or standards of the customer.

Quality Control Plan (QCP). A written technical management plan for a specific technical product or service (i.e., a contract requirement or an in-house effort). The QCP becomes part of the Project Management Plan (PMP).

Quality control sample. A sample collected to monitor and control the quality of sampling operations. This type of sample is analyzed by the primary laboratory and typically includes split samples, duplicate samples, and various types of blank samples.

Quality control. The overall system of technical activities that monitors the degree of excellence of environmental data so that the stated requirements of defined standards are achieved.

Quality improvement. A management program for improving the quality of operations.

Quality indicators. Measurable attributes of the attainment of the necessary quality for a particular environmental decision. Indicators of data quality include precision, bias, completeness, representativeness, reproducibility, comparability, sensitivity, and statistical confidence.

Quality management. The aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systemic activities pertaining to the quality system.
Quality system. A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products,

items, and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Quality. The totality of features and characteristics of a product or service that bear on its ability to meet the stated or implied needs and expectations of the user.

Representativeness. A measure of the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process, or an environmental condition.

Reproducibility. The precision, usually expressed as variance, that measures the variability among the results of measurements of a sample at different laboratories.

Screening Level Data. Data that are generated by less precise methods of analysis, less rigorous sample preparation, and less stringent QA/QC procedures. The data generated provide analyte identification and quantification, although the quantification may be relatively imprecise.

Service Agent. A non-regulated entity within the federal government that provides project-specific environmental clean-up or compliance services support to another federal agency. The USACE is a service agent to a number of regulated federal agencies.

Significant deficiency. Any state, status, incident, or situation of an environmental process or condition, or environmental technology in which the work being performed will be adversely affected sufficiently to require corrective action to satisfy quality objectives or specifications and safety requirements.

Split sample. A sample which has been collected, homogenized, and divided into two or more portions for analysis by multiple laboratories. Applicable for all test parameters except those involving volatile analytes where homogenization might affect the concentration of volatile substances (see also duplicate sample).

Standard operating procedure (SOP). A written document that details the process for an operation, analysis, or action, with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

Surveillance. Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that the specified requirements are being fulfilled.

Technical Liaison Manager: The central point of contact (POC) at the HTRW CX assigned to each individual MSC. The TLM provides the following support for each assigned MSC: manages all project-specific technical assistance and technical review assignments including resolution of significant issues; communicates regularly with designated central POC at the MSC to apprise of new technical guidance/policy and identify needed general guidance/policy, training needs, and technical assistance needs.

Technical review. A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work, but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements are satisfied.

Technical systems audit. A thorough, systematic, on-site, qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data verification/ validation, data management, and reporting aspects of a system.

Total Army Quality (TAQ). A leadership philosophy and management approach which empowers all individuals to build on the aggregate capabilities of our quality Army and focuses on continuous process improvement to meet or exceed the expectations of internal and external customers.

Traceability. The ability to trace the history, application, or location of an entity by means of recorded identifications. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for quality for the project.

ENCLOSURE 5
ACRONYMS USED IN
HTRW & CDQM PROJECTS

A2LA	American Association for Laboratory Accreditation
ACASS	Architect-Engineer Contract Administration Support System
ACO	Administrative Contracting Officer
A-E	Architect-Engineer
AFARS	Army Federal Acquisition Regulation Supplement
AIS	Automation Information System
ANSI	American National Standards Institute
ARMS	Automated Review Management System
ASQ	American Society for Quality
ASQC	American Society for Quality Control
BCOE	Biddability, Constructibility, Operability, and Environmental
BD/DR	Building Demolition/Debris Removal
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CCAS	Construction Contract Appraisal Support System
CDQAR	Chemical Data Quality Assessment Report
CDQM	Chemical Data Quality Management
CEFMS	Corps of Engineers Financial Management System
CEGS	Corps of Engineers Guide Specification
CEMP-RT	Corps of Engineers, Military Programs Directorate, Environmental Restoration Division, Environmental and Chemical Engineering Branch
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CMD	Corrective Measures Design
CMS	Corrective Measures Study
COC	Chain of Custody
COEMIS	Corps of Engineers Management Information System
COR	Contracting Officer's Representative
COTS	Commercial Off-The-Shelf
CQAB	Chemistry Quality Assurance Branch, office symbol CEERD-EE-Q
CQAR	Chemical Quality Assurance Report
CQC	Contractor Quality Control
CX	Center of Expertise
DERP	Defense Environmental Restoration Program

DETS	Directorate of Engineering and Technical Services
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
DPM	Deputy for Programs and Project Management
DQO	Data Quality Objectives
EB	Equipment Blank
EC	Engineering Circular
EE/CA	Engineering Evaluation/Cost Analysis
EFARS	Engineering Federal Acquisition Regulation Supplement
EM	Engineering Manual
EP	Engineering Pamphlet
EPA	(U. S.) Environmental Protection Agency
ER	Engineering Regulation
FAR	Federal Acquisition Regulation
FDM	Feature Design Memorandum
FOA	Field Operating Activity
FS	Feasibility Study
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Sites (DOD)
FUSRAP	Formerly Utilized Sites Remedial Action Program (DOE)
GRO	Gasoline Range Organics
HQ	Headquarters
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic, and Radioactive Waste
ID	Identification
ID/IQ	Indefinite Delivery/Indefinite Quantity
IFB	Invitation For Bid
IRC	Issue Resolution Conference
IRM	Information Resources Management
IRMSC	IRM Steering Committee
IRP	Installation Restoration Program
ISMP	Information Systems Modernization Program
ITA	Innovative Technology Advocate
ITRC	Interstate Technology and Regulatory Cooperation
ITRT	Independent Technical Review Team

LAN	Local Area Network
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LQMM	Laboratory Quality Management Manual
LUFT	Leaking Underground Fuel Tank
MARC	Multiple Award Remedial Action Contract
MARKS	Modern Army Record Keeping System
MDL	Method Detection Limit
MFR	Memorandum for Record
MILCON	Military Construction
MOA	Memorandum of Agreement
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSC	Major Subordinate Command
NARA	National Archives and Records Administration
NELAP	National Environmental Laboratory Accreditation Program
NEPA	National Environmental Policy Act
NPL	National Priorities List
O&M	Operation and Maintenance
OE	Ordnance and Explosive
PA	Preliminary Assessment
PA/SI	Preliminary Assessment/Site Inspection
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PDT	Project Delivery Team
PE	Performance Evaluation
PM	Project Manager
PMBP	Program and Project Management Business Process
PMP	Project Management Plan
POC	Point of Contact
P-RAC	Pre-placed Remedial Action Contract
PRB	Project/Program Review Board
PROMIS	Project Management Information System
PRP	Potentially Responsible Party
QA	Quality Assurance
QAC	Quality Assurance Coordinator
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan

QC	Quality Control
QCP	Quality Control Plan
QMP	Quality Management Plan
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RFP	Request for Proposal
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RMS	Resident Management System
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDL	Sample Detection Limit
SF	Standard Form
SFO	Support for Others
SI	Site Inspection
SmART	Small Action Remedial Tool Contract
SOP	Standard Operating Procedures
SPD	South Pacific Division, Corps of Engineers
SRL	Sample Reporting Limit
SSHP	Site Safety and Health Plan
TAQ	Total Army Quality
TERC	Total Environmental Restoration Contract
TIC	Tentatively Identified Compound
TLM	Technical Liaison Manager
TPH	Total Petroleum Hydrocarbon
TQM	Total Quality Management
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WES	Waterways Experiment Station

Enclosure 6
QUALITY MANAGEMENT FOR
Water Control and Water Quality (WC/WQ) Products

1. Purpose

This enclosure provides specific information on the Quality Management of Water Control Management and Water Quality Management products and services within the South Pacific Division.

2. Applicability

This enclosure applies to each district and division element having responsibilities for WC/WQ management of civil works projects within the South Pacific Division. Management of the different components of this program extends beyond the Engineering Division of each District.

3. References

3.1. ER 1110-2-240, Water Control Management.

3.2. ER 1110-2-1400, Reservoir/Water Control Centers.

3.3. CESPD R 1110-2-8, Guidance on the Preparation of Deviations from Approved Water Control Plans.

4. CESPD Water Control Center (WCC)

Reference 3.2 designates the Division Water Control Center (WCC) as the organizational unit responsible for all water control activities in its Major Subordinate Command (MSC), to achieve project purposes such as flood control, water quality control, water supply, irrigation, navigation, hydropower, recreation, fish and wildlife, and to alleviate sediment and erosion problems. To fulfill these responsibilities, SPD WCC staff will actively participate in the Quality Control Process as outlined in this enclosure.

5. Quality Management of WC/WQ Products

The districts in the preparation of Quality Control/Management of WC/WQ products will follow appendix D, with the following additional requirements:

5.1. Choosing a Water Control ITRTeam Member. Because WC/WQ products are approved at the MSC (reference 3.1 and 3.2) and because of the sensitive nature of these products, the district will consult with MSC WCC staff in determining an appropriate water control ITRT representative for each water control product. The consultation will result in a Water Control ITRT representative being selected from either:

- The MSC WCC staff (Note: If a MSC WCC staff member participates in the technical review of the product, that MSC WCC staff member may not be involved in the Division QA of that product),
- The local district producing the product, or
- Another district.

5.2. Each district office will prepare district Programmatic QCPs for WC/WQ Products. Study and review team members for water control products shall be formed from the Water Control/Water Management Section/Branch, H&H, Environmental, Operations, Counsel, as well as any other appropriate disciplines.

5.3. Certification of WC/WQ products will be done by the responsible function chief.

5.4. WC/WQ products for which the above apply include:

- Water Control Manuals (for individual Projects)
- Master Water Control Manuals
- Interim Water Control Plans During Construction
- Preliminary Water Control Plans
- Final Water Control Plans
- Standing Instructions to Project Operators for Water Control
- Drought Contingency Plans
- Annual Flood Damages Report
- Initial Reservoir Filling Plans
- Hydropower Operating Agreements

6. Division Policy Compliance Review & Quality Assurance

6.1. Division Policy Compliance Review & Quality Assurance (PCR&QA) Team. Upon submittal to Division of any WC/WQ document, a member of the MSC WCC shall be designated as the Team Leader for the PCR&QA process. The Team Leader will determine which CESPD offices will participate in the process.

6.2. Some of the documents listed in Paragraph 5.4 above require extensive coordination, review prior to Division approval. For each WC/WQ document, the Team Leader will determine which CESPD offices will participate in the review of that WC/WQ document. To maximize efficiency, reviewers will be selected only from those disciplines involved in the specific subject area under review.

6.3. Team Comments. The Team Leader will assemble any comments, resolve comment discrepancies, and provide them to the originating district office. The district shall prepare written responses and submit them and the revised document (if necessary) to the MSC WCC. Throughout the entire PCR&QA process, district and division staff will work as a team to resolve any outstanding comments. A Division Team follow-up will be performed to ensure that all comments have been adequately addressed. If necessary, a meeting may be held at CESPD to

resolve disputed comments. The MSC WCC Chief shall decide any unresolved/disputed Comments.

6.4. Document Approval. The MSC WCC will recommend approval of the product, upon satisfactory response to any PCR&QA comments.

7. WC/WQ Reports

7.1. The following WC/WQ documents are routinely prepared by different district offices and submitted to the division WCC:

- Water Control Management Activities
- Water Quality
- Sedimentation Activities
- Annual Flood Damages
- Water Control Data System Master Plan
- Status of Water Control Data Systems
- U.S. Geological Survey (USGS) Cooperative Streamgaging Program
- Data on Non-Federal Hydropower Development Plans
- National Weather Service (NWS)/Corps Cooperative Reporting Network Program

7.2. The following WC/WQ documents are submitted to CESPD on a non-routine basis:

- Project Operations During Flood Emergencies
- Post-Flood Summaries of Project Regulation
- Flood Emergency Plans
- Initial Reservoir Filling Plans
- Hydropower Operating Agreements

7.3. Special Suspense Dates. Each of these routine WC/WQ documents submitted by the districts requires CESPD review and subsequent submittal to HQUSACE as a component of the division report. A suspense will be designated by the WCC. Generally, district reports will be submitted to the WCC at least three weeks prior to the HQUSACE suspense date.

7.4. WC/WQ Budgetary Data. District WC/WQ budgetary data is submitted to District Operations Branch as a component of the District Engineering Division O&M Budget Request. A copy of the districts' consolidated (i.e., WC/WQ) component will be sent to the division WCC for information purposes. The suspense date for submittal will be specified by the WCC based on the scheduling of the CESPD O&M Budget meeting in May of each year.

8. Deviations from Approved Water Control Plans

Because of the time sensitive nature of most deviations, reference 3.3 was prepared to outline what information needs to be compiled and submitted by a district office to the division office. Per reference 3.3, districts closely coordinate the preparation of these packages with a division

WCC staff member. As the District Commander or his designated representative makes deviation requests, a Quality Control Certificate is not required for a deviation request. However, a peer review should be performed to assure that the proposed deviation request reflects coherent logic and that the assumptions, scopes, timing are consistent, complete, and reasonable.

9. Technical and Policy Issues Needing CESPD Assistance

It is the ultimate responsibility of the District Section/Branch Chief who manages the water control management activities to highlight to the Division WCC any policy issues that require attention within the water control management arena, including, but not limited to review of Water control management documents.